THE INSTITUTION OF PRODUCTION ENGINEERS JOURNAL

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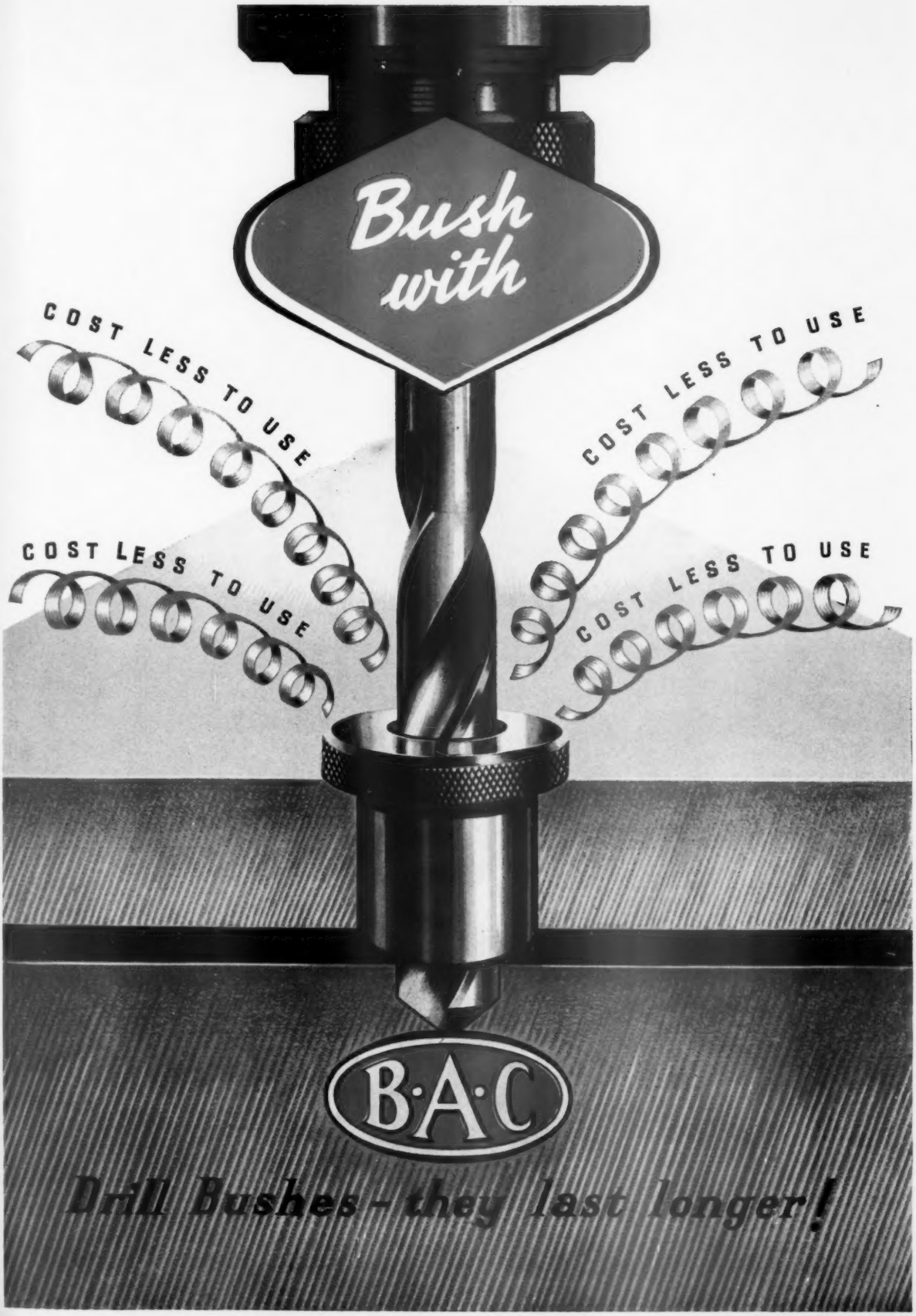
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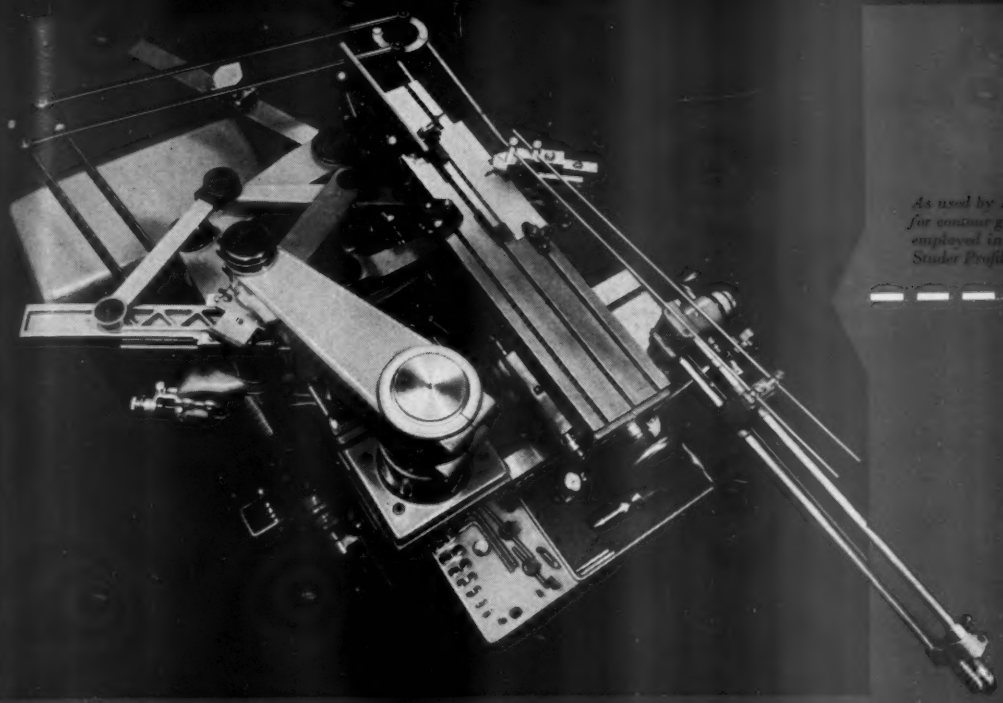

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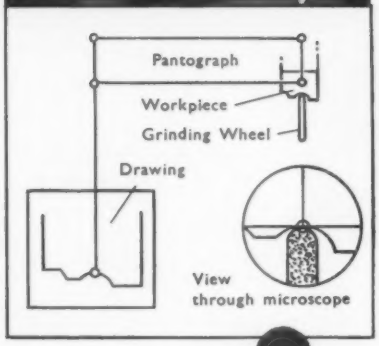

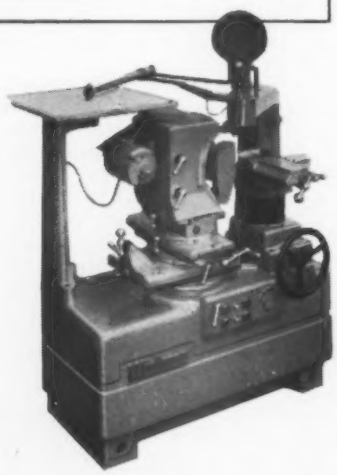

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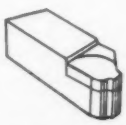

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The Institution of Production Engineers Journal
VOL. 32. NO. 9 SEPTEMBER, 1953

"The Universals of Production"

by M. SEAMAN, M.Sc., M.I.Mech.E., A.M.I.E.E., M.I.Prod.E.,
Director and General Manager, British Oxygen Engineering Co. Ltd.,
Chairman, Editorial Committee.

THE Editorial Committee of the Journal have decided that it is their duty to members of the Institution, and of a great profession, to outline through appropriate authorities "The Universals of Production". It may be thought that this is a somewhat grandiloquent title, but at the same time it must be remembered the tremendous duty and responsibility which lie with the profession of production management in this modern world. Just as we have the Universals of Law and the Universals of Medicine, so the scope and professional standards and conduct of the Production Manager are of such importance in the modern world that it behoves us to have a clear picture of what these primary responsibilities and modes of conduct are, and the bases upon which they rest. The best analogy of justification to me is what lies between the Production Manager and the man of medicine. Whilst the man of medicine deals with the human body, and its implication in respect of the welfare of the human individual is of such importance that a whole fabric of ethical and technical conduct has grown up, so the Production Manager dealing with the important social production units has a like responsibility and requires guidance, training, stimulation, and inspiration to meet his problems in this day and age, and in a day and age when the rapidity of technical and man-management developments are of such a high order that a considerable burden is placed upon him to lead, direct, and inspire for the good of the common weal. This then is the justification of the approach, and it is hoped that the authorities chosen by the Editorial Committee will display to the satisfaction of members of the profession in both the United Kingdom and Commonwealth, and in the rest of the world, the main problems and attitudes which lie before us and must be solved.

The Ethical Approach

It has been recognised for many centuries in religion, law, and medicine, that the root of the professional integrity of these professions is ethical; it lies in that moral leadership which under all circumstances creates that confidence which ensures to the community as a whole that its leaders in the profession concerned are capable of setting such standards and such developments, as will be satisfactory to the personality and well-being of the community as a whole. At the root the same problem has become the paramount problem of the profession by production management and technology. Worthwhileness of effort, stability of employment, knowledge of the enterprise of a production organisation, are the vital springs upon which the whole level of effort depends to produce goods and service to the community, and in this sense money earned as a reward for execution of professional responsibility becomes secondary to the elements of sacrifice and courage which, on many occasions, reflect the ethical attitude of the leaders and members of a great profession. Members of the Institution will know how leaders of thought in religion, law, medicine, government, and industry, have constantly combined with the Institution in its various meetings to forward this broad base of professional and personal integrity, and at the root this moral value is one on which we must build.

Balance of Effort

The half century in which we stand is unique in certain aspects. The rate of technological development is of such high order in terms of both war and peace, that no Production Manager is worth his salt who does not realise the implications and burden which this implies. It may be said that, in the three zones of

home consumption and development, export, and war material, the United Kingdom and Commonwealth, as with all other industrial communities, have special burdens greater than at any other time in the modern world. It is too often not realised that whilst up to 20 per cent. of the national effort may be committed for war material, the rate of development of weapons upon which security rests may attract double this percentage in the technical and production development fields, and therefore much greater budgeting in the educational and training fields must be made to provide trained personnel capable of constantly meeting and staying ahead of the problems which arise. Conversely, what is left after security is available with its developments to promote home consumption and export consumption upon which the material welfare of the nation and all its trading opposites rests. The need for development of backward countries in terms of consumption is a paramount need both in the political and in the economic fields, and it can only stem from the levels of productivity and development which are able to support it. Thus, the budgeting of balance of effort as epitomised in such reports as the U.S. Presidential Report on the supply of materials, is a need in order to appreciate balance of effort, and to give a consistent long-term perspective to the activities of the profession as a whole, and the necessary advice which it must tender to all other bodies within the nation and the government.

Human Needs and Welfare

All production and services depend ultimately on the man or woman. The end of all production is consumption for human needs and welfare. These statements may seem trite and self-evident, but they bulk very largely in our day-to-day work. The human being is the power source from which the energies of production and development are derived; place him in one set of circumstances and he is only half as efficient as he will be in another set of circumstances. It is the arrangement of circumstances to evoke the maximum effort and result which is the overall function in the human sense of production management and technology. This is only one half of the story. The understanding of this by the individual man and his devotion to it is the other half, and must be based on a balanced understanding of what is required of him in effort and forethought and what he, his family, the nation and community get out of it as a result. Unless this is made perfectly clear within the production community and the nation as a whole, then stresses and strains resulting in great inefficiency can arise.

Consumption Aspects

At all times the Production Manager must look to the consumption aspects of his activities in the long-term trend. There have always been massive increases of human consumption leading to the possibilities of higher expressions of human enjoyment and capacities. The increment of productivity only of a nation is only half the story because it is the increment of consumption which counts, and this particular topic is included in order to avoid the one-eyedness of considering as a profession only productivity and not consumption.

Its correct balance is vital to us as a profession, and its long-term problems pose the most intensive technology management studies.

Financial and Production Activity

It has become a truism of the fast moving modern world that financial and production activity is a function of world confidence in the future. If the nation as a whole feels that financial manipulation lies undisclosed in the hands of the few, then a high degree of industrial dissatisfaction arises, leading to all the many problems which follow in its train. It is therefore imperative that the balance of economic expenditures shall be clearly demonstrated to all concerned in the nation, to give a sense of confidence in the proposition that :

(a) Consumption and standards of living will rise.

(b) They will be maintained.

(c) The fullest use will be made of all scientific and human developments promoting the good of the nation and the world as a whole.

The technical aspects of this are more and more being displayed by leaders of thought in the financial, economic, and production management world. Their facts and results are simply disassociated from the jargon of the expert and can be made clear to all, resulting in the building of a background of confidence in industrial relations which is paramount. The history of the past thirty years has been very significant

in this than at any other time in history, and the transmission of knowledge and meaning in this field is a subject of high importance to Production Management.

We shall call on our colleagues on the financial and economic side to explain these issues to us and we, on our part, must make the effort to understand and see them in their true relation.

Education

One of the striking features of the modern age is the extent to which general and technical education is the strength upon which modern well-being is built.

The part of the production manager and technologist is of the highest importance, since it is through this medium that much of the scientific development is transmitted into general use.

The root of advance means, that the effort in the educational field which forms the human potentialities into effectiveness, changes the concept of balance of education which has been effective for many centuries. It is arguable that all specialists, of whatever profession, are primarily production managers and engineers. A little thought will reveal how common the topics of mechanical handling, organisation, process analysis, production development, are to all professions, and it is becoming more and more clear that the modern world in its technological studies is based upon the twin pillars of chemical and production engineering, with the classical specialisation in electrical, mechanical, civil, military, and chemical engineering. A considerable reorientation has occurred in countries subject to the stimulus of very high rate development. The constitution of university and higher technological training has passed from the humanistic to the technical, and in the modern age to a combination of the humanistic and the technical, and is gradually reaching the desired balance where the minor absurdities of specialisation are being dissolved. A forthright grip of this attitude is important to the production manager and technologist.

The Technical Problem

The key aspect of the technical problem is its rate of progress: transmission of scientific and human potentialities into effectiveness is a definition of production management and technology. Inevitably, the problem is to convert potential powers at a high rate, and this is the crux of the techniques involved. It is reasonable to state in the long-term trend, that no factor of under-employment or under-consumption need exist in the modern world, providing the techniques of production management can convert human material potentialities into effectiveness in the shortest possible time. Whilst this is a very broad statement, its implication and detail is our day-to-day problem. Brought down to the shop floor, our potential scientific facts applied in actual goods and services, and at what rate: this is the technical side of our profession.

Management

Management is the control and multiplication of potential energy. In its widest sense, it is an extension of the personalities and energy of all within the production community. Much has, and will be written about management because of its continuous and ever-changing problems, but it may be said that the same universal energy facts are true, as are true in the physical energy field.

An analogy lies as follows:

An electronic device manipulated with microscopic energy, and in combination with other electronic devices, is the control of all our large physical energy applications, i.e. the switchboard of the large power station, the control panels of automatic chemical plants, placed in the hands of one human individual, control massive quantities of energy producing goods and service. The mechanism of management has the same constitution, the continual search for means to promote maximum control and efficiency for the good of all, and the sharing of all the human elements in the management which will result in their greatest good. At the lowest level of perception this means each is a cog-wheel in a soulless machine: at the highest level of perception, this means that each plays his part for the greatest good of himself and the whole, and it is the continual balancing within the individual of his part in relation to the whole which constitutes the effective principle of management.

The Editorial Committee are asking various authorities to expound in the widest sense on the above matters in the interests of the profession as a whole. We hope that the result will be an expression of universal viewpoints common to our profession in the United Kingdom and the Commonwealth, and which will join us to all members of our profession throughout the world.

SECOND PLENARY SESSION

Friday, 26th June, 1953

SPEAKER :

SIR HUBERT HOULDSWORTH, Q.C., D.Sc.,

Chairman of the National Coal Board.

I SHOULD like to thank the President for the very kindly welcome which he has given me and, if I may venture to be so presumptuous, to congratulate him on his tact in merely saying that I was frequently in the news, without making any detailed reference to what the news had to say!

I thought that this afternoon I might venture to talk to you about some of our problems, but in particular about one which is closely allied to your own studies and your own profession, a subject which in its broadest sense is by no means new to the coal industry. It is, however, a narrower aspect of it about which I should like to speak, namely the modern techniques of method and work study which have been developed in this and other countries since the early part of the century, and which have proved in other industries so valuable in raising productivity. I think that I may follow the illustrious example of your President in still using the word "productivity", as he did this morning.

Establishing New Techniques

I propose to tell you what we in the coal industry are doing to establish and develop these techniques to help us in our all-important and extremely difficult task of raising our productivity. But perhaps I should preface this by indicating some at least of the broader differences between coalmining and most other industries, and the special difficulties which face us.

Coalmining—like all mining—is an extractive industry. Unlike manufacturing industries it does not purchase raw materials or manufactured things and refashion or assemble them. Its main task is winning coal from underground and carrying it to the surface. In this country, if not everywhere, the conditions under which the coal is mined vary enormously, not only in different places or in different seams, but from day to day, from hour to hour almost, in any particular part of the same mine. Some of our coals are very difficult to get; problems of roof control, disturbed strata, changes in seams and many other factors contribute to the problems of the mining engineer. Moreover, by the very nature of the job, and its inherent dangers, a rigid code of practice has to be imposed which places safety in a position to which all production problems must take second place.

In coalmining we meet immediately all the complications which are involved in the constant changing of underground conditions. Of course, in no industry are work standards absolute : they must always change with changing methods of manufacture, and finality is rarely reached in production methods. But in mining geological changes are rapid and unpredictable, and though the problem of moving conditions is not new, it is at its most acute in mining and far beyond anything common in normal industrial processes. You will appreciate easily enough what this means in relation to fixing work standards; and yet, as I shall have to show, we need the analytical approach and all that "work study" comprehends perhaps more than any other industry.

We have also the problem of the wide dispersal of underground activities, which limits supervision to a degree which makes it far less than the supervision which is possible in most industries. And do not forget that coalmining is in the dark!

These are some of the inherent problems in the nature of our business of coalmining. But there are many other factors to be considered, some of which have an important bearing on the subject which I am discussing. Between the Wars coalmining went through the fire. It suffered in the most devastating way from the ravages of depression, of contraction of output and of employment, and of financial difficulties. It suffered most greatly on the human side, since coalmining is located according to the

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Sir Hubert Houldsworth

occurrence of coal and thus often creates an inflexibility in employment. In 1913 the country produced 287,000,000 tons with 1,107,000 men. In 1920, still booming after the War, output was 230,000,000 tons and manpower 1,227,000; but by 1933 output had fallen to 207,000,000 tons and the labour force to no more than 772,000. Some places suffered more greatly than others. For instance, the steam and bituminous coal regions of South Wales—leaving out the anthracites of West Wales—produced 52,000,000 tons in 1913, when 32,000,000 tons were exported. In 1936 exports of those coals were only 13,000,000 tons and total production 28,000,000 tons, whilst the men employed in the industry in this part declined from 218,000 in 1922 to 100,000 in 1936.

These things do not happen without leaving their mark. The iron entered into the soul of the industry. I need not remind you of the havoc made to human beings, to whole communities; but I think it is important to emphasise the effect of this savage restriction of demand on the management of the industry.

The Years of Depression

Every improvement in efficiency in the lean years meant throwing a man on the streets. Wages were low, so labour was rated low. There was little capital development—how could this be expected if everywhere there was over-capacity? Men could be recruited from the pit yard from day to day if needed and no one could look confidently to a future continued demand for which a carefully balanced age pattern would be necessary. Many colliery undertakings were living from hand to mouth. Most pits worked short time.

Today, as you know, we are in an entirely different position. We have not, since the early part of the War, met the demand for coal in full. In the last few years we have been short of men; but recruitment has recently been good and we have at the moment plenty of men in many places, though we are still badly short in others. Wages of coal miners have risen—as I believe they should have done—from a very low position amongst industrial workers to the very top of the list.

These higher wages, and a shortage instead of an excess of capacity, have accentuated our need for higher productivity. Moreover, the demand for coal at any price (and thus any efficiency), which was continued after the War years into nationalisation, and which was necessary, brought with it attendant evils; since to concentrate solely on the volume of production in itself breeds inefficiency. We have to recover the proper emphasis on costs as well as on output.

Meanwhile, colliery management has become an immensely more intricate business than it was in the past. The engineering aspects of it are now highly complex; and the man-management side requires the utmost skill and devotion.

On top of all this we have an industry which was starved for many years of development, with a desperate need for reconstruction. By "reconstruction" in this context we mean changes on the surface, in the shafts and winding equipment, and in the underground structure of the mines—their layout and transport systems. We have a great programme in hand for this. It is essential and inescapable to provide capacity and to obtain improvements in efficiency. The execution of this programme has been, and still remains, a matter for anxiety for a variety of reasons; but we can and must catch up.

But apart from the shafts and structures of the collieries we have another basic component of our job—the actual winning of coal at the coal face. This involves not merely getting coal, but loading it, carrying it to the roadways, forming those roadways as the face advances, supporting and controlling the roof.

The getting of coal has been helped increasingly by mechanical cutting and blasting. The proportion of cutting rose from 31 per cent. in 1930 to 58 per cent. in 1938, and today is 83 per cent. The process of carrying the coal (by belt or other type of conveyor) to the roads and to convenient points for loading into cars or tubs has also been mechanised increasingly; the proportion of output mechanically conveyed has increased from 53 per cent. in 1938 to 89 per cent. But in the intermediate process of loading we have as yet made limited progress, and although many new types of machine and systems of work are under trial—and many of them are promising—only 5 per cent. of our coal today is power-loaded.

Similarly, though drilling is now virtually all done by electric or compressed air equipment, the process of stowing away stone from the formation of roads, or for the control of the strata, is still largely unmechanised. So we have still technical engineering problems to overcome, problems which are for the mining engineer as such rather than the Production Engineer.

Scope for Improved Efficiency

In our immediate operation of the mines, however, there is an immense field for improved efficiency. A great deal can be done, and done quickly, under the existing conditions of the pit, and more as a result of minor changes at quite small expenditure. These improvements can be done in advance of, or in conjunction with, major reconstruction. Often they are worth while even if the life of the working is very short. This is the first place where method and work study come in. They have also an important part to play in the planning for the long term.

The application of the principles of work study is not altogether new in coalmining. There have been and are today many evidences of this in simple and, to some extent, in more highly-developed forms. In some cases colliery companies in the past employed modern methods, but this was on a limited scale. There is nothing fundamentally new in these techniques, as you know; but they provide effective means for applying common sense, for analysing things properly, and seeing what the busy manage-

ment official cannot, or does not, see. This is more true in collieries than anywhere else, because colliery management is perhaps the most exacting management task in all industry. I know of no body of professional men who are more hard-working, more devoted to their job, more anxious to make improvements, than the very harassed colliery managers today. The colliery manager, of course, is in a key position, because it is at the pits that the coal is produced.

Application of Work Study Techniques

The Board, having studied the subject, and with the help of big undertakings such as I.C.I. and Unilever, decided that they must ascertain how work study techniques—with all the experience gained over the years in other industries—could best be developed in mining. They realised that the application of work study raised more difficult and complex problems in mining operations than in repetitive work in a factory. As I have said, mining is inherently far less susceptible to any form of standardisation and offers much less uniformity than most manufacturing processes. Moreover, it has to be admitted that technical efficiency in mining is so largely dependent upon good planning that work study may simply reveal defects in planning which may prove difficult to correct. But, despite all these obstacles and difficulties, if we are to improve productivity and then production we are convinced that we must take up the challenge presented to us by the success of these methods in other fields.

Indeed, although it may be more difficult to introduce these techniques in coalmining than elsewhere, coalmining needs them perhaps more than any other industry. We need them not only for direct purposes of analysis and to seek to improve efficiency, but also for the inter-related purpose of comparing the results of our different production units. Just because physical conditions in mining vary so greatly, and straight comparison of costs, and productivity in terms of output per man-shift is thus invalidated, management needs common and basic standards, a common scale and common terminology, in order to assess the quality and standard of control at the collieries.

The Two Lines of Approach

Having discussed the matter with our National Consultative Council, on which all grades in the industry are represented, it was therefore decided to approach the question from two angles. First, a mining engineer occupying a responsible management post in one of the Divisions was attached to headquarters and was given as thorough a training as could be provided over a period of about a year with outside industries. This training was undertaken by an established firm of consultants who were specialists in this field. In addition, arrangements were made for the mining engineer to take courses with Imperial Chemical Industries and with Unilever, and also to attend a short course run by the T.U.C. which is used for training members of its constituent bodies in this subject.

The second line of approach was to use the consultants who were specialists in work study but who were without previous knowledge of coalmining, to carry out a specimen investigation at a typical colliery. It was emphasised that this specimen work would relate only to the possibilities of achieving economy and increased efficiency by short-term improvements in methods, equipment, labour deployment and the organisation of work flow.

So we had on the one hand a man with a close knowledge of coalmining considering *work study*, and on the other hand engineers experienced in *work study* methods coming fresh to the mining industry. The colliery selected for the experiment was a guinea-pig—the aim being to discover the best means of developing work study generally.

After consultation with all the trade union officials concerned, who were particularly helpful and gave their full co-operation (without which, of course, the experiment would have been impossible), a pit was selected and investigations were concentrated mainly on underground haulage, shaft winding and the surface operations generally. In addition, some surveys were made of the coalface and other collieries were visited in order to obtain a wider background of coalmining. In the space of a year, and without any special knowledge of the mining industry, the consultants were able to indicate ways whereby substantial improvements could be made in the efficiency of the operations they had studied by relatively small changes of equipment, spreading of the work load more equally and by some redeployment of haulage workers.

Surveying the Field

The main purpose of the work done at this colliery was to discover and demonstrate the scope for the latest methods of work study in mining and the best way of applying them. The consultants formed the opinion, and successfully showed, that there was a very large field for this work in the industry. Our mining engineer who had been trained during the period of the experiment reached similar conclusions, although he had approached the matter from an entirely different background.

In the light of these special enquiries, the Board were strengthened in their conviction that the mining industry could ill afford to ignore the fully developed work study techniques and that it was a matter of urgency to adopt these methods, although they realised that the build-up of the work study installations would have to be to some extent experimental, and in any case would need to be carried out in stages.

It was apparent that the success of this development would depend primarily upon (i) obtaining the support of the unions, and (ii) convincing management. We are dealing here with an industry where the personnel is a little conservative-minded on some occasions. With these basic considerations in mind, it was necessary to find the right location for work study sections and how best to employ them.

The Board's organisation consists of a headquarters,

eight major and one minor Divisions, about 50 Areas, and over 850 collieries. The Areas are the effective operational units—as it were the "companies"—and they are the places where specialist services should mainly be located, except in so far as individual collieries need such service, or where a central service is desirable. For a large colliery a permanent Production Engineer concentrating on work study may well be necessary, but by and large it seems clear that work study units should be set up at Area level, from which they will operate at the collieries under the direction of the Area General Manager, who is in charge of and responsible for the work of his Area. He, of course, has a Production Manager, who will obviously need to take an interest in this work, because it affects the operation of the pits.

We shall normally have work study under the wing of or very closely associated with our Area Planning Departments, since the link between planning and work study is particularly strong in coalmining; but we are laying down no precise pattern, as we should like to see a natural development of the organisational side rather than dogmatise at the start.

Training Facilities

The main burden of work study is thus in our Areas. But there are certain functions which we need to perform at first at headquarters to secure the developments which we desire. The initiative in the steps I have described had, in fact, been taken by our Production Department, and to make general progress it was clear that they would need to provide the stimuli, and to furnish facilities for training of Area work study engineers.

We want there to be a natural growth, and nothing will succeed better than a positive demonstration of success. To make a start, therefore, the Divisions were asked to select a few established mining engineers for training under arrangements which we had made. After training, those men were to return to their own Areas, where they would instal work study in its fullest sense.

Now let me break off to explain why, at this stage, we proposed to use mining engineers for this purpose. I do not suggest that in the long run there is necessarily any reason to train a mining man in work study rather than a work study man in mining; indeed, there are some advantages in the latter; but to begin with we felt that the gospel would be preached better by an experienced mining official, respected on his own ground, who had been trained in work study, rather than by an outsider who might, in what I have already referred to as our somewhat conservative industry, find it difficult to convince management.

Our headquarters training and "commando" section is working at present with the consultants, since we believe at this stage at least that we must have outside assistance. As I have said, the first job is to provide training. The men drawn from the Areas are undergoing a course of some months' duration in which they receive theoretical and practical training, the latter in works outside mining by arrangement with our consultants. For the time being we prefer to go outside, but shortly we shall be able to provide this practical training at collieries where work study in its fullest sense is well established.

We are also providing a short appreciation course for management officials, since I need not remind you that their education on how to use the results of work study is no less necessary than the training of specialists in the work itself.

As each Area man completes his training he will set up in his Area a work study unit. Advice will be available, when required by the Area, from headquarters, but this will, we hope, gradually become unnecessary.

A Central Research Section

The headquarters section have a further function to perform, though it will take time to tackle this, since the process of installing and helping the Area work study sections come first. We shall need to have a central research section, analysing and comparing different methods of work and machines. The headquarters section will not, unless specially requested by an Area, undertake a local investigation at a particular colliery, but they will make comparative analyses and appreciations of the efficiency of different ways of doing things, or of different machines. With the insular traditions of individual coalfields, we believe that there is much to be gained by disseminating the best practices from one to another; but we must be assured that they are the best, and as accurate measurement as possible, taking into account all the variable factors of mining, is an absolute necessity if we are to be sure what is best.

If in our interest in method and work study I have given the impression that we are racing ahead with a wide-scale introduction of these techniques, I must correct a misunderstanding. We are, in fact, proceeding slowly; we are proceeding slowly because the training must be thorough and because we want to stimulate our Areas and Divisions to want work study rather than to impose it, and slowly, above all, because we must have the absolute confidence of the trade unions and the men in what we are doing. Nevertheless, whilst I hesitate to prophesy, I believe that in time we shall, with the helpful co-operation of the unions, build up as sound an organisation of work study and production engineering as will be found in this difficult industry anywhere in the world, and that we shall reap the benefit of it in improving our efficiency, and thus the economy of the whole nation.

Need for A New Outlook

But, of course, no one new method or new approach is going to solve the difficulties of this industry; it can only be a hand-maiden in such solution. Your President, in the course of his address this morning, referred to research work and to a new outlook. We want a new outlook in this industry. We want an ever-increasing capacity on the part of those who are engaged in administration, in technical work and in the manual processes necessarily associated with the industry.

Good personnel, properly used at proper points, are far more important than the form of an organisation. The success of any organisation will depend ultimately on the capacity, the devotion, the vision, the initiative and the drive of individuals, and particularly of individuals in key positions. They must, of course, be assisted by the best form of organisation which we can devise to help them in their task, but the primary problem is to get the proper men in the proper places.

As the Reid Report showed, there was before nationalisation a dearth of technical men with adequate experience in the large-scale planning which is necessary in an industry of the size and complexity of the coalmining industry and which, as the Reid Report suggested, had a task no less than that of rebuilding the industry. It was necessary, therefore, to attempt to correct this shortage of technical men. In what I said when I was discussing our experiments in work study methods, I paid a very high tribute to the management that we have in this industry; but we want, with the increased specialisation which is so necessary, and with the vast reconstruction work which we have to-day, more and more technical men, and more and more of those with the broader outlook which is necessary for this large-scale planning.

Scholarship Schemes

It is a slow job to make good a deficiency of that nature. We started some years ago a scholarship scheme by which we offer 50 scholarships for training in mining departments at the universities to those who are in the industry, and 50 to those who are still at school, making 100 scholarships offered annually which are divided in that way. In addition, we offer some for ordinary engineering subjects, because we want to build up a stronger engineering department, mechanical and electrical, as well as having more mining engineers.

The quality of those selected has been good, on the whole. When I tell you that 82 have completed their basic courses at the universities, and that 42 of those have completed them with first or second class honours in mining, you will see that we have managed to select some raw material worthy of training; but, of course, they are only at the beginning of their training after graduation, and therefore we have established a practical training scheme for those who have completed their university courses, whereby they are virtually treated under the old apprenticeship scheme by which students were articled in the past to mining engineers. They are put under the general supervision of our Area General Manager himself, or the Area Production Manager, and given three months in this operation, six months in that, and so on, for a period of three years. Then, when that three years is over, which means that from the time of their selection some six or seven years have gone by, they must go through the various ranks of the junior officials — deputies, overmen, undermanagers and so on — to get a full practical experience of the industry. It will be seen, therefore, that there must be a minimum of ten to twelve years before the raw material which has been selected has obtained the training and the experience necessary to help us effectively in the improvement in techniques, in planning and so on.

One of the unfortunate features of this scheme is that, despite the fact that the financial payment to the selected scholars at the university is in line with that of the State scholarships, we are not getting, of the standard we require, anything near the full 100 that we are prepared to take each year. We have now to embark, therefore, on a missionary crusade in the public schools, the grammar schools and so on in order to try to attract those who have received a good fundamental training in the sciences, and who have the proper temperament to look towards this great basic industry for their career. It is an industry which can give, compared with other engineering outlets, a reasonable remuneration. It is certainly an industry which can provide for a man who is anxious to serve his fellows an opportunity of fulfilling that ambition.

Importance of University Training

You heard Professor Matthew speak in the very short discussion this morning. It is interesting to note that some twenty-five or so years ago there was, at the University of which he is now a distinguished professor, what might be called a vintage period in the mining department. There was a professor there, Professor Moss, who conceived the idea of persuading colliery owners to give financial assistance to those who were prepared to go to the universities to read mining. With those promises, he went himself as a missionary to the schools and he persuaded many young men of the proper type, who had no family connection with coalmining at all, to go to the University of Birmingham and read mining. They have a triennial reunion of their students, and they were kind enough some months ago to invite me to one of those gatherings. Looking round, I was amazed at the number of those, now occupying with distinction and success high places in the coalmining industry, who had been trained at the University of Birmingham in that particular period, many of whom to my personal knowledge had not in their family history, so far as they knew, any former connection with this industry.

We have to do that. The lesson is clear. Until we have succeeded as he succeeded we shall not be doing fully our job, even with these schemes, of attracting to our ranks many of those who can render us very good service.

Making the Right Impression

After all, it may be that outside the mining areas there is a wrong impression of what work in a colliery is like. Some months ago, for example, I had a medical man spending the week-end with me, and on the Sunday afternoon I said to him: "I am going down a pit in the morning; would you like to come with me?" The reply which I got, quite quickly, was: "If you will come and have a cup of tea with me in the typhoid ward this afternoon, I will go down the pit with you in the morning." There is a good

deal of misconception about coalmining by those who are not used to it, and that is one of the difficulties which we shall have to overcome.

Again following your President this morning, I would suggest that the efficiency of an industry is not going to depend only on those who occupy key positions and who possess the necessary energy and vision, but in the end it will depend also on having a happy team at work, a team that know that fair dealing will be given and a team, too, of the highest average ability and training. We are not neglecting that side of the matter. We have trained a large number of people at special courses to go out and hold similar courses in the coalfields for the deputies and foremen who are our non-commissioned officers, those who are in touch with the men, those who really create the impression of how the National Coal Board does its job and how it regards its manpower. Every deputy in every Division is going through a course of a week's duration where these problems of man-management and approach are thoroughly discussed, together with a certain number of technical matters.

We are holding, and have been holding for some time, full-time courses for a fortnight or so for different grades of our more senior officials, because, after all, the difference between the problems of a small unit and those of a large unit is rather more than a question of degree. There are other inevitable differences. Indeed, I should think that every large organisation has, in greater or less measure, the same type of problems to deal with as those which are exercising our minds to-day. We must do all that we can to increase the training and broaden the outlook of all who are employed in the industry.

Attracting Juveniles to the Industry

We have our training scheme for the juveniles who enter the industry. Incidentally, whatever our shortcomings may be in this or that direction, we have achieved one victory. It is not many years ago that the parents in the mining villages were using all their influence to prevent boys going into this industry, and this was cumulatively creating difficulties both in the numbers in the industry and in our age-group distribution. When I tell you, however, that in 1951 not the recruitment but the difference between recruitment and wastage of juveniles was 11,000, and that went up in the succeeding year, 1951-52, to over 15,000, and last year rose to over 20,000, I think you will agree that at present we are succeeding in attracting juveniles to this very vital industry. We do not gain productively from their services at the moment in proportion to their man-power, and we are often taken to task for it, but I think that those who are engaged in industry will see that there cannot be a direct proportionate relationship when we take in such a very large part of our new man-power as juveniles. We have to take, however, a long-term view, and we are going to benefit from it in the future.

Development of Research Work

Your President rightly referred to the importance of research in an industry. Ours was an industry which until after the War, with the exception of one or two big companies, had done little or nothing so far as research work was concerned. We have built up one research organisation which, with its scientists and technicians, numbers 350. We have recently established a second one which is in process of being built up to the same size. When we have done it all, and these two research organisations are at work for us, it will be costing us about ¾d. per ton. I ask you, how much do the oil industry spend on research work? Yet here we are dealing with an industry where research work had been neglected. We are casting our bread on the waters, but I am quite sure that we shall have our reward in the years to come.

We are encouraging fundamental research by financial assistance and by scholarships at our universities, and I think that we are, as probably Professors of Mining will agree, giving new life to the teaching in the mining departments by the development of research work there, which has been conducted largely as a result of our assistance; because I believe that there can be no live teaching in any subject unless it is taught in a department by those who are themselves engaged in research work.

I have referred to the conservative nature of this industry. Those who are trained in the mining departments which have this research outlook will not normally be research workers but, having seen research work in progress, and having had the broadening of vision which that opportunity will have given them, they will be likely to go into this industry with a far more progressive mind than could be expected from a person who had not had that opportunity.

We have, as I have said, some first-rate managers. They have in many cases come up the hard way, with great credit to themselves, by evening study, or day study if they have been on night shift, on the top of rather laborious work. They are the salt of the earth. They have grown up with the men. They understand the human problems. There will always be room for that type of man, whatever the scholarship scheme is, and we are encouraging that type also with day release and so on. We want, however, to blend those who have the valuable knowledge obtained by hard experience, with the capacity for work developed by conducting their studies in addition to their work, with those who have the broader outlook about which I have been speaking.

If time had permitted I could have gone on to deal with many other developments, but I hope that I have said enough to convince you that we are trying to do that for which your President pleaded this morning by bringing a new outlook into this industry. It will take time before the full results

(*Concluded on page* 399)

The Conference Banquet, 25th June, 1953

Guests arriving for the Conference Banquet are received by the President and the Chairman of Council, with Mrs. Burke. Left to right are (top): Lord and Lady Swinton, Sir Cecil Weir; Sir Hubert Houldsworth, Sir Cecil Weir, Mr. Harold Burke; (centre) the Mayor and Mayoress of Harrogate, Councillor and Mrs. E. P. Oddy, Sir Cecil Weir; Mr. R. Kirchner, immediate Past President, London Section; Mr. Walter Puckey, Mr. Harold Burke; (bottom) Mr. and Mrs. E. Percy Edwards, Sir Cecil Weir, Mrs Harold Burke; Mr. and Mrs. G. R. Pryor, Sir Cecil Weir.

FINAL PLENARY SESSION

Saturday, 27th June, 1953

SPEAKER :

SIR CHARLES GOODEVE, O.B.E., D.Sc., F.R.S.
Director of the British Iron and Steel Research Association.

IT may have been in the mind of your Chairman that the speaker at this Final Plenary Session should provide you with a little light entertainment or, alternatively, a stimulating address giving the solution to your production problems. I am glad to find, from what I have heard this morning, that both those requirements have already been met. I should not have been competent to deal with either of them. My contact with production engineering has been slight, and took place quite a number of years ago.

I was afraid also that you might expect me to pour oil on troubled waters. I am not very good at that—I am much better at starting fires. If I start a few inadvertently in my talk, perhaps Mr. Hancock will kindly put them out !

Operational Research

I propose to talk to you about one of the things which has interested me and some of my colleagues a great deal in recent years, namely, the extension of the use of scientific methods to the study of the operations of production. This extension has gone on under the term "operational research". You may ask whether it is very different from the work studies about which you have heard so much. I shall not attempt to draw a line between them; they are obviously in part much the same thing, except that operational research goes into very much wider fields and with a greater rigidity of scientific methods.

The term "productivity" has become very popular in recent years—almost too popular; it has become almost a hackneyed expression, a little worn and tired. It has, however, been a useful one and is still useful, because it is related to our material standard of living. What is more important still, the average man in the street, who seems to find difficulty in understanding economics, seems to be able to accept this relation between productivity and standard of living. That is why it has been such a good propaganda term. Also, we have needed in this country some common objective in this post-war period, in order to attempt to imitate the efforts which we were able to put forward during the War.

More recently, however, the term "productivity" has come to mean much more than this. The study of productivity is becoming a branch of science, the science of operations and decisions. It is becoming a powerful tool of management, simply because it provides more precise quantitative analyses of the factors which affect the performance of plant and men.

The science of operations and decisions uses techniques very similar to those in other branches of science, but there is one important difference in degree. In the natural sciences one often prefers to wander at will in the territory to be explored. In operational research, however, a clear objective is necessary at the start, not just to save time, but to make it possible to use the powerful scientific methods which have achieved such successes elsewhere.

The raising of our standard of living makes a very good general objective, but the linking of this with productivity is not quite so straightforward as is commonly thought. For example, the standard of

Photo: Walter Stoneman

Sir Charles Goodeve

living is more closely related to the things people have and can use than to the actual rate of production of the community. It is the clothing people *possess* that matters and this is related to the annual production of clothing multiplied by its average life; in other words, we must bring in a concept of quality or durability and not think of production purely in terms of quantity. Another complication is the subdivision in our objective between the standard of living in the immediate and in the later future; we could easily make a better Britain in 1954 at the expense of a Britain in our old age or in the time of our grandchildren. We must also remember that the standard of living depends on the efficiency with which we consume or use our products. There is no use raising the productivity of food or coal production if these commodities are then wasted. In America, petrol is produced efficiently but it is then used in motor vehicles made heavy and powerful and, as a result, fewer passenger miles per gallon of petrol are then obtained. In Britain, we waste our hard-earned coal in smoky open fires.

I am putting these points on one side, however, because they are not the purpose of my talk. If we are going to deal with the subject of productivity in a scientific manner, the very first thing we must do is to be quite clear about definitions. I know that this subject of terminology is liable to give rise to arguments, but I shall deal with it quickly.

I was surprised a few years ago, when listening to a lecture by a Production Engineer, to hear him say that in his factory the productivity had increased from 46 to 38 man hours per ton. That may not be an ambiguous remark, because one knows what he means, but you will agree that it is a little strange. It is probable that he had been reading some of the many pamphlets which have been produced on this subject, nearly all of which use this term "productivity" both ways up. Indeed, I hope you will not mind if I quote from a Report[1], produced by your own Institution in collaboration with the Institute of Cost and Works Accountants, which says that "productivity is the ratio of input to output" and then, in the very next sentence, says that productivity is measured in output per man hour. It is a little difficult to get a subject clear when you find that sort of thing, but your Institution is in very good company, because the American Bureau of Labour Statistics, which is in the forefront of all these studies, does exactly the same thing[2], and rather more frequently. It is almost as bad as the statement by a fuel officer that the fuel efficiency of his plant had increased from 32 to 18 per cent !

Definition of Productivity

There is a growing body of opinion, particularly in this country, which holds that we must define "productivity" so that when it increases it goes up. I hope that the confirmation of this will be the first task of the Standards Committee of which we heard this morning. In other words, productivity must be defined as the ratio of the *output* of a given product or group of products (measured by quantity and not by time rate) to the *input* of one or more factors of production, or resources.

To help remember the definition, I may quote the predicament of two bishops who were queueing up at the gates of Heaven. In front of them was a very charming young girl and the bishops wondered how she came to be in front of them. They had had their full span of life and activity, and here was this very young lady ahead of them in the queue, so they spoke to St. Peter about it afterwards. St. Peter said to them: "My dear bishops, this young lady started to learn to drive a car about three weeks before she came up here, and in those three weeks, she put the fear of God into more people than you did in the whole of your lives". She had a high productivity !

The reciprocal of this productivity ratio is an extremely useful quantity, as we shall see, and it is perhaps because of its usefulness that so much confused nomenclature has been used. For some time now, however, the term "resources consumption rate" has been used and this is probably the best term in use at the present time for the ratio of input to output.

In the definitions of "output" and "input", which can be found in any of the pamphlets already referred to, a satisfactory degree of standardisation of definitions has been achieved. In the case of output, problems arise when a given factory or unit of plant turns out a "mix" of products (some rolling mills) or parrallel-or by-products (gas works producing gas, coke and coal tar products). Also, account should be taken, as already observed, of quality. The measurement of input is mostly a problem of definition and convention, but in complex outputs a problem of allocation arises.

Similar considerations also apply to the dimensionless "indices" of productivity, which should be defined with the standard or reference productivity in the denominator. I would like to refer you to an interesting paper by Dr. Easterfield[3], in which this whole subject is analysed carefully and in detail.

Costs

In any discussion on productivity, it is not long before someone raises the question of costs. In order to anticipate this, I think it is a good thing to *start* any discussion with the subject of costs. It is true that the relation of standard of living to costs is a little more complicated than it is to productivity. On the other hand, the whole of our social structure is built on a monetary system and improvements in productivity are extremely unlikely to take place unless they have been shown to be economically sound. The other advantage of starting with costs is that you can more easily make friends with the accountants, who have been analysing costs for many years with the greatest of care.

Analysis of Costs

Every efficient manager knows from his accountant how the cost of any of his various products can be broken down into its components. Each of these

components corresponds to the consumption of one of the resources required for its production, and one can analyse the total cost into whatever degree of detail is required.

However, we can analyse costs in another way. Each cost component can be broken into two parts, a resources consumption rate and a price (i.e. per unit consumed). This is best illustrated by the following Table, which I have used on a number of occasions.[4] The Table shows the overall cost, in a hypothetical works, of making one ton of pig iron broken down into the costs of the four main groups of resources, raw materials, fuel, labour-time and plant-time. It also shows each cost component broken into its parts. For example, the coke consumption rate is 0.85 tons coke per ton of pig iron and the price, £5 per ton of coke, the product giving £4. 5s. 0d. in the units of per ton of pig iron.

TABLE 1.

Analysis of cost of making one ton of pig iron.

Resource	*Consumption Rate*	*Price*	*Cost Component* £	s.	d.
Raw materials, iron ore, etc.	1.8 tons	£4. 10s. per ton	8	2	0
Limestone	0.2 tons	£1 per ton		4	0
Fuel—coke	0.85 tons	£5 per ton	4	5	0
(net gas credit)	(65 therms)	(2.4d. per therm)	(*less* 13		0)
Labour-time	3.2 man-hours	4s. 6d. per hour		14	6
Furnace-time including overheads	0.08 hours	£15 per hour	1	4	0
			£13	16	6

This method of analysis has one very important advantage. Consumption rates are much more basic than costs because they are related only to the equipment, the process and the organisation. In other words, they are related to those things that are under the manager's control. They are exact reciprocals of productivities which are measures of standards of performance in a particular unit or organisation.

Prices, on the other hand, while they depend to a great extent on the ability of the buyer, depend mostly on other people's productivity and on the relation of supply to demand for that particular resource. This relation in many cases can fluctuate very widely and thereby obscure any other change that was inherent in the consumption rate part of the cost component. A good example of such fluctuations, is the great variation in shipping rates when tramp ships are chartered on the open market. Today they are one-half the level of a year ago.

We see, therefore, that accurate comparisons or predictions of trends for the future can better be made on consumption rates than on cost components. Predictions of the latter can best be made by combining predictions of prices and of consumption rates.

I believe that the preparation of a Table corresponding to the one shown is an essential preliminary to any study on productivity, if only to put the various consumption rates or productivities in their proper perspective. One needs to know quantitatively the relative importance of, say, plant to labour costs, or labour to fuel costs. You will note that in the case of ironmaking the plant costs are about twice the labour costs, but in many other processes the labour is the higher component.

An analysis as shown would inhibit statements of the type that I heard made the other day, to the effect: " My labour costs are two-thirds those of the Americans, so my productivity must be pretty good ". In this case the firm's wages were exactly one-third those of the Americans and an analysis would have shown the speaker that his labour consumption rate was exactly double the Americans', or his labour productivity was exactly one-half.

This morning's discussion on cost consciousness leads me to point out another advantage of using productivities and consumption rates. Some companies are a little reluctant to pass the whole of their costing down to the workmen in the plant, because some workmen become argumentative in consequence, but no such dangers arise in publishing productivities and consumption rates; those firms who do that regularly are finding it very successful. It is best to use consumption rates when dealing with materials and fuel, and productivities when discussing labour. There is a psychological reason for choosing the right term, because people will instinctively know the direction in which it ought to change.

How a Consumption Rate or Productivity is Made Up

Our analysis can now go deeper and to achieve this there are two roads of approach. For those industries with high labour costs, one can go straight on into the study of labour-time consumption rates and the factors which affect this quantity. Studies have been made of OHP (Operative Hours per 100 lbs Production) in the cotton industry and MMDSP (Man Minutes per Dozen Standard Pairs) in the shoe industry. These are not very pretty terms but they have proved to be extremely useful. These studies show the advantages of using a quantity which can be broken down further into different categories of labour. This cannot be done with productivities.

For those industries which have high plant charges, it is preferable to start with plant-time consumption rates or plant productivities and later to go on to labour productivity *via* the manning rate. Thus the manning of a blast furnace is such that there are on the average 40 men per furnace including maintenance and indirect labour. You will see from the Table that the labour-time consumption rate (3.2 man-hours per ton) is forty times the plant-time consumption rate (0.08 plant-hours per ton). If one were working with years as the time unit instead of hours the ratio would be higher by the number of crews (in this case 3.65) required to operate the plant because, of course, a man does not work 24 hours a day, as he does the plant.

In these cases the approach from the plant side is the better because the operation of that plant is generally in accordance with instructions laid down by the management, and only to a lesser extent is it

governed by the actions of the individual workmen. This approach also makes it possible to study the factors which affect plant-time consumption rates or its reciprocal, plant productivity. I think it is easier now to go back to the quantity productivity and explore how we can increase the output of a given plant. In doing this, of course, one must watch carefully to make sure that the consumption rates of the other resources are not increased to an extent that would nullify the gain from the plant productivity. In particular, one should try to prevent the manning going up, or even try to get it to go down.

In many of the cases that we have explored, the plant productivity can readily be separated into two quantities. The first concerns the size of the plant and the second the speed at which it is operated, i.e. its driving rate. In the case of a ship or a lorry, the separation is obvious. In the case of an open hearth furnace it is also fairly easy because the size can be taken as tons tapped, and the speed or driving rate as taps per week. There are, however, a few complications here because the output is affected by the shape of the furnace. Heat transfer is proportional to the area of the furnace and some operators prefer to use this as the measure of size. In the case of a blast furnace it cannot be decided in advance what is the real measure of size, but by a statistical study of a large number of furnaces, one can find a reasonable relation. We now define the size by a formula which allows for the dead space at the centre of the furnace.

In the case of machine tools it is easy to separate out the speed but the measurement of size is not always so obvious. However, in many cases it can be measured by the number of operations which go on simultaneously. In the case of wire drawing there is no size factor at all because the output is measured in length and the productivity, therefore, is solely governed by the speed. In all these cases, of course, one must be careful to state exactly what one does with idle and loading times, etc.

If I might just recapitulate, we see that I have broken down the plant cost component into a price, a size and a speed, related according to the following equation :

$$\text{Plant Cost Component} = \text{price} \times \text{plant consumption rate} = \frac{\text{price}}{\text{plant productivity}} = \frac{\text{price}}{\text{size} \times \text{speed}}$$

Also, we have :

$$\text{Labour Cost Component} = \text{Wages} \times \text{Manning Rate} \times \frac{1}{\text{size} \times \text{speed}}$$

In each case the units in which the quantities are measured must be carefully chosen, so that they cancel out to leave the answer in £. s. d. per unit of output.

Comparative Studies

I would like to look back now for our objectives in all this analysis. We are mainly concerned, I think, with comparisons. That is, either with making, firstly, comparisons of consumption rates or productivies over a period of time; secondly, comparisons between similar plants in our own country or between our own plants and those in industries abroad, or thirdly, comparisons with what we could do if we made various changes in a particular plant. The first two are to help us to decide a policy, and the last is an integral part of planning for the future.

Inter-works Comparison

Inter-works comparisons of labour productivity or consumption rates already perform an established duty in the cotton and shoe industries, to mention only two. In the case of plant productivity, the steel industry has now, for several years, circulated to all producers data which show the position of some of their own units of plant in relation to that of the whole country. At longer intervals, comparisons are made with plants abroad. I show in the figure on page 391 one example of a chart which is circulated annually concerning the hot metal fixed furnaces in this country. You will see that it is drawn out to show the size and the driving rate of these furnaces and there is a curved scale showing the multiplication of these two quantities, the productivity of the furnaces. Each point represents one or more furnaces in a melting shop and each company knows, from its own code number, which are its own furnaces and can see how these stand in relation to the others. The diagram, of course, does not take account of many variations in the qualities of the raw materials and of the products which affect seriously the refining time in the open hearth furnace and therefore the driving rate. It does, however, provide a competitive stimulus to managers to increase both the sizes of their furnaces and the driving rates, and hence their productivities.

From a scientific point of view, this is only the beginning of the problem. The analysis in this and other cases of iron and steel making units is proceeding further to study the effects of raw materials and products and the inter-relation where it exists between size and driving rate.

The Size of Plant

I would like to make, at this stage, one important generalisation. We know, from the numerous productivity reports, that a large part of the whole British manufacturing industry is operating at plant productivities one-half or less than that of their American counterparts. When this is analysed, the biggest factor is often found to be size. Every time the British workman taps a blast furnace, pulls the throttle on a locomotive, or hoists a load of bricks, one-third or less material moves than when his American counterpart performs this same operation. It is difficult to get ourselves out of this situation without having available more capital resources in the country as a whole. What, however, is serious and is insufficiently condemned, is the use of our precious capital resources to build equipment which is sub-standard in size or productivity.

This brings me to my first bit of incendiarism. The size of any piece of plant which you can put into any works is obviously related to the size of the

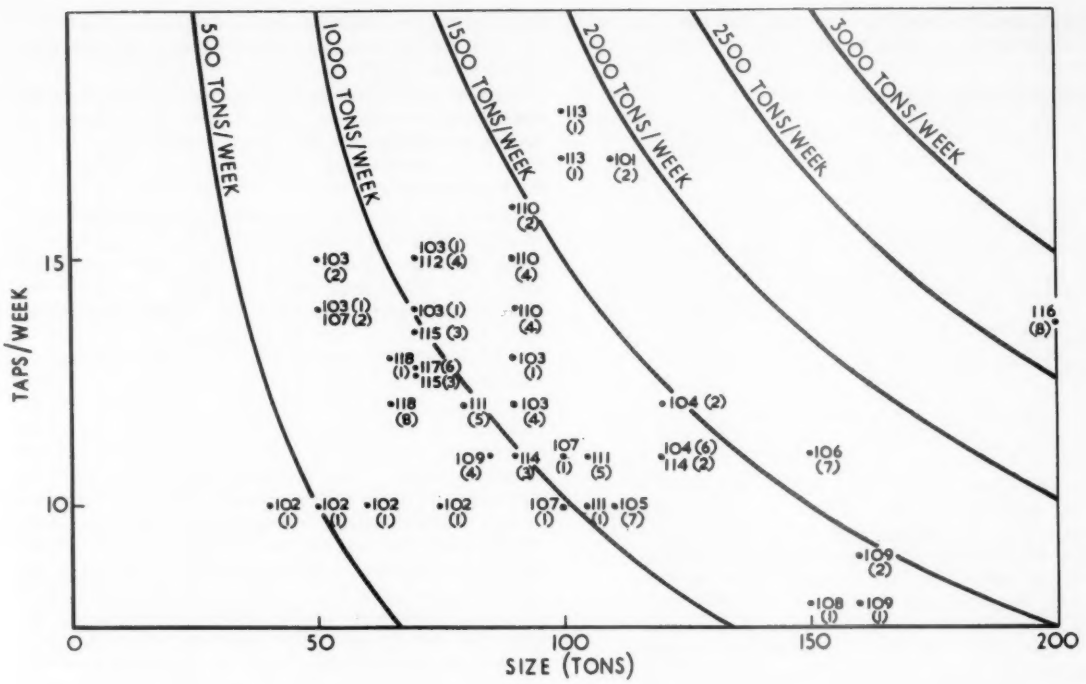

FIG. 1

PRODUCTIVITY COMPARISON OF BRITISH HOT METAL FIXED FURNACES IN 1952
EACH POINT REPRESENTS ONE OR MORE FURNACES
(THE NUMBER BEING GIVEN IN BRACKETS) IN A MELTING SHOP
AND EACH COMPANY KNOWS WHICH ARE ITS OWN FURNACES FROM THE CODE NUMBER

works of which it forms a part. You cannot put a plant with a big output in a small works. There has been a good deal of talk about small firms. Much of this, I suspect, is sentimental and another part is due to dislike of the large firm, as big firms sometimes tend to get a little monopolistic. The above type of analysis makes it now frequently possible to define a "too small firm" as one which cannot effectively use plant up to modern productivity levels. Many of these "too small firms" and firms that are inefficient for other reasons, are able to stay in existence today because of the high demand in this inflationary period. Also, they can take advantage in the export trade of the abnormally low value of the £ sterling in relation to the dollar, when considered in relation to the respective costs of living. It might even be that this coupling works both ways and that the £ is held down by the existence of too many "too small firms". Certainly a rise in the value of the £ and a return to our position of being the greatest buyer in the world would be effectively impossible until our productivity level is raised.

Other Studies

In this talk, I have kept to the basic and simpler concepts of productivity studies but you will not be surprised to learn that many of the real gains from this type of work are obtained when one goes deeper into the subject and uses some of the new methods that are now being classed under this term operational research. For example, we have so far assumed that there is no coupling between the various resources consumption rates. In most cases, of course, there is a coupling but it is difficult to find it in quantitative terms. The methods often involve considerable experimentation and observation. When the coupling is found, however, it is possible, by introducing existing or predicted prices, to determine the present or future coupling between the cost components in the total cost of a given product. As this is then known quantitatively, one can determine the effect of a given change on the total cost of the product. More commonly one can, by means of a series of graphs, determine the optimum conditions for operating a given process, that is the conditions under which the total cost is minimised.

These studies are especially difficult when some part of the operations involves fluctuations of one sort or another. These may arise from some random factors, such as occurs in the arrivals of ships at ports, or from the existence of batch processes in a series of continuous processes, etc. There is here a very

wide branch of science but one which is only in an early stage of development.

Measuring Plant Capacity

I should also like to refer to another branch of productivity analysis which is of considerable importance, and this is bound around the word capacity 5. Almost every plant manager would say that his plant had a certain capacity, but he might be thrown into confusion if you argued with him about his methods of measuring that quantity. I cannot here go into this subject to any appreciable extent, but I would like to mention a few of the experiences we are having in the iron and steel industry. We like to think mainly in terms of an "effective" or "economic capacity", which is the best output that a plant can be expected to give under normal operating conditions of raw materials, fuel, maintenance, etc. This allows for normal shut-downs for repairs or holidays, etc. The plant however, is unlikely to be utilised to 100% of this capacity and the output for the period may frequently fall below. The ratio of output to effective capacity is called the "utilisation" and this itself is governed by abnormal shut-downs or reductions in output.

It is also useful to have a "theoretical capacity" which is the theoretical output which would be obtained if there were no maintenance shut-downs or holidays, in other words, if the plant were available to operate 100% of the time. "Availability" is defined as the ratio of the effective capacity to the theoretical capacity. Its departure from 100% is the measure of the normal or expected idle time of the plant.

The isolation of these two quantities, utilisation and availability, makes it possible to analyse them further with the expectation that improvements can be made in both of them.

Speed Limit in Road Transport

Perhaps I could interpolate here a reference to one of the greatest failures to make use of operational research into productivity, the retention of the 20 m.p.h. restriction on road transport vehicles as recently announced by the Minister of Transport. Studies of the operation of this restriction show that it does not bring down the normal road speed below a reasonable level of about 30 m.p.h., which is very fortunate because a slower speed would probably be more dangerous and it certainly would cause serious road congestion. The restriction does, however, limit to 60%, the possible hours per shift that a vehicle is moving as the total journey is scheduled to be made at an average of 16 m.p.h. The savings that would accrue from raising the present availability from about 60% to 80% by a permitted schedule of 22 m.p.h., but with no change in the actual speed, are known to be equal to some £'s per man-week, about half of which would be paid in increased wages to the drivers and the rest to the customers. The picture of a Conservative Government banning an increase in productivity and a Socialist Opposition cheering a decision not to allow an increase in pay can only be based on ignorance of the worst kind!

I think the failure here is due to the fact that the operational studies that have been made have not been promulgated in the right quarters.

Re-equipment

One of the greatest problems that has faced British managements has been that of getting equipment to bring their productivity up to acceptable standards. We have had insufficient resources to meet the strongly competing demands for capital equipment, for export and for civil consumption.

I have recently had a talk with some economists closely connected with current events, and I understand that the era of restrictions on capital for investment is now pretty well over. I do not quite believe this, because so long as we have "negative unemployment",* as we have today, we shall be restricted even on the manpower side; nevertheless, we are unquestionably entering a very much brighter period than the one we have been through in the past, and therefore the importance of making the right decisions about the plant to be put in becomes very much greater. The methods of operational research, by providing a quantitative basis for decisions, can help in a great many cases. A manager must not expect, however, that the scientific method will decide the objectives for him. It may help him to clarify the objectives and to give them each a proper weight. This having been achieved by co-operative action with him, the operational research worker can then assess the various alternatives with a high degree of precision.

Conclusions

I would like to end by referring to a few general conclusions. Productivity studies show up regularly the well-known fact that the desirability, from an economic point of view, of re-equipping with new and higher performance plant, is greater in a country where the cost of labour is high compared with the cost of plant. In any particular type of manufacture, this fact can be put in quantitative terms.

With the present exchange rate, wages in the U.S.A. are three times what they are here, whereas the cost of new plant is not more than 1½ times the cost in this country. In other words, the ratio of the cost of new plant to labour wages is more than twice as great in this country as it is in the U.S.A. If this ratio continues at its present level, it will be impossible to bring our productivity up to that in the U.S.A. The high cost of plant in relation to labour

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*Most concepts of full employment refer to a maximised standard of living, and demand a certain percentage of unemployment depending on the method of statistical measurement used. This basic unemployment is to take account of the men changing jobs and includes those who are unable to work. In the British system, most estimates lie between 3% and 5% of the total employed. If this optimum is taken as the reference point, the present 1.8% is on the negative side. In simpler language, we are in a worse position than just being short of spare manpower.

is already having a hindering effect on the progress in this country towards higher productivity.

The difficulties of the plant manufacturers are many and one of these is the obsolete nature of some of the plant in their own works. It is obvious that the re-equipment of the plant makers' works should be a matter of top priority in this country. Not only should we encourage the Government to give them every possible assistance, but each one of us should co-operate with the plant makers in the standardisation and improvement of design. This means bringing the plant makers much more into the confidence of the users of the plant than I have seen done in many parts of British industry.

We must have much more standardisation of plant, and the plant maker must be able to make 50 off one set of drawings and patterns instead of having to modify them for every customer. We have certainly found in my own research association that one of the most productive things which we can do for the steel industry is to get the steel companies to agree on what sort of plant they want, instead of all having different ideas. I suggest, therefore, that that is a problem which applies also to the machine tool makers.

You have an active Research Association—the Production Engineering Research Association—and you should ask it to give serious attention to this subject if it is not already doing so.

My final point has both an encouraging and discouraging side. Once a country has attained a high productivity level, she at the same time achieves surplus resources which she can readily apply to further re-equipment so as to attain a still higher productivity.[6] The United States is in that position today, even with her demands for defence purposes, but Britain is far from it. She is frustrated by a shortage of work people, technicians and managers, too large a proportion of whom are struggling to operate with obsolete or low productivity equipment. Every step forward is indeed a much harder one to make here than in a country such as the United States.

We gain encouragement, however, from two aspects of this problem. We know that every step forward in productivity makes the next step an easier one. Secondly, we know that our pent-up demands, arising from the arrears caused by the War, mean that we need fear a possible period of recession much less than many other countries where production is already at a high level. We can re-equip with the confidence that our plant will be needed and utilised. We can safely adopt a policy of Production for Plenty, and in doing so fulfil the responsibilities of our heritage.

References

(1) Measurement of Productivity—Applications and Limitations. Issued by the Joint Committee of the Institute of Cost and Works Accountants and the Institution of Production Engineers (undated).

(2) Measurement of Productivity—Methods used by the Bureau of Labour Statistics in the U.S.A., published by O.E.E.C. 1952.

(3) British Management's Uses of Productivity Indices, by T. E. Easterfield. "The Manager", February, 1953, p. 96.

(4) Using Science to Reach Decisions. Charles F. Goodeve, "The Manager", May, 1953, p. 257.

(5) Operational Research as a Science. Charles F. Goodeve. Journal Operations Research Society of America, in press.

(6) Iron and Steel Productivity Report, June, 1952.

BRITISH STANDARDS

The following Standards have recently been issued and may be obtained, post free, at the prices stated from the British Standards Institution, British Standards House, 2, Park Street London, W.1 :—

B.S. 122 Part 1 : 1953. Milling Cutters (12/6).

B.S.1887 : 1953. Weighing and Height Measuring Machines for use in Maternity and Child Welfare and School Health Services (2/6).

B.S.1983 : 1953. Accuracy of Chucks for Lathes and Drilling Machines (4/–).

B.S.1987 : 1953. Classification of Diamond Powder in the Sieve and Sub-Sieve Ranges (2/6).

ISSUE OF JOURNAL

Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

JOURNAL BINDERS

Members are advised that binding cases for the new size Journal are now available, and may be ordered from Head Office. The cases, which are strongly made and covered in dark red leather cloth, with "The Institution of Production Engineers Journal" in gilt on the spine, will each hold 12 copies of the Journal. The price per case is 10/-, post free.

A limited number of binding cases for the old size Journal are also available, at the reduced price of 2/6d. per case, post free.

RESEARCH PUBLICATIONS

A number of copies of the following Research publications are still available to members, at the price stated :

Report on Surface Finish, by Dr. G. Schlesinger 15/6
Machine Tool Research and Development 10/6
Practical Drilling Tests 21/–

These publications may be obtained from the Production Engineering Research Association, "Staveley Lodge," Melton Mowbray, Leics.

CONFERENCE SUMMING UP

by E. W. HANCOCK, M.B.E., M.I.Mech.E., M.I.Prod.E., F.I.I.A.
Past Chairman of Council

Director and General Manager, Humber Ltd., Coventry

YOU will agree it is quite a task adequately to sum up this Conference, as the high levels of the addresses, lectures and discussions need to be co-ordinated in this summing-up so that our thoughts are objective.

I propose to sum up under four main headings as follows:—

(1) Speeches and addresses at the Conference Dinner and Plenary Sessions.
(2) Discussion Group reports.
(3) Conference organisation, and activities of the Institution of Production Engineers.
(4) My own personal contribution.

SPEECHES AND ADDRESSES

We have had addresses by Lord Swinton, Sir Cecil Weir, Sir Charles Morris, Sir Hubert Houldsworth and now, today, by Sir Charles Goodeve.

These great men—great national figures—have come to our Conference and have inspired us all by their broad references, and we do indeed thank them.

There is no finer inspiration to a young Institution or to young men than to have such great men giving freely of their time and their knowledge to such a Conference as this.

Lord Swinton, as you will remember, commenced his address in much the same way as Sir Charles Goodeve did this morning.

His references had to do with the interpretation of words. He, as you know, did not like the word "productivity", but preferred the word "production".

Sir Charles, this morning, has referred to the Institution's interpretation of the word "productivity", but it does seem to me important that we should not become too involved in these new terms and definitions, but use simple words which we all understand.

During his address, Sir Charles used the term "negative unemployment" * and this again will need some interpretation.

If, at such a high level, there is a problem in the interpretation of words and definitions, it indicates a major problem in conveying our thoughts to others as to exactly what we mean by the words we use.

This represents one of the major problems of higher management, as unless we are clear in our emphasis, we may not convey the correct meaning.

The outstanding point which Lord Swinton made, to my mind, was "Tell the workers! Don't be afraid! They are all British!" He also referred to the tremendous assets of this country, namely, the quality and integrity of the British peoples.

A country—or an industry for that matter—can only be as good as the people in it, and if our peoples are of the high quality to which Lord Swinton referred, then this surely is a great asset to our country and, therefore, let us use this great quality to the best advantage.

Sir Cecil Weir, with all his wealth of experience, tells us to have a new outlook and to look ahead.

What an inspiration it is to have a man such as Sir Cecil Weir leading this Institution, as our President! With all his wealth of long experience, he is still a "grand young man"—still very busy with all the vast new jobs which he is now undertaking.

We regret immensely that he has to relinquish his position as our President, but I can assure him that the work which he has done, not only at this Conference but during his term of office, has been an inspiration to us all which will last for ever.

You will remember he displayed the typical keen young man's outlook when he said "we dare not be complacent".

This, to my mind, is not only an inspiring thought but is a warning, as he pointed out that "plenty will flow from productivity". My interpretation of this reference is that plenty will flow if we all in this country work and make plenty.

Photo: L. E. Broome
Mr. E. W. Hancock

He also referred to the need for flexibility of outlook. I think this point should be emphasised, because if we maintain flexibility of outlook and keep our thoughts, as well as our plants, flexible, this is a

* *see footnote, page* 392.

common denominator to our technical advancement and development.

Had it not been for the flexibility of mind and the flexibility of our production men and their plants, our research and design activities would not have made the very satisfactory progress which they have so far, and such progress, when reviewed, is surely something of which we, in this country, can be justly proud.

Sir Cecil told us the story of the man who said that he intended to earn more than he spent. I think that he was probably referring to a young man who had come from the north of the border. My own definition of a young man who is making progress is one who earns more than he receives.

Mr. R. A. P. Misra, President of our Bombay Section, gave a remarkably good survey this morning of the problems in India, and he indicated that India was over-producing in certain directions, which was continuing to embarrass that great country relative to its supplies.

No doubt if Mr. Misra studied the example of Harrogate, with the birth rate being under the death rate, this, emulated in India, might be some solution to his problem, but he can be assured that this country will do all possible to assist India when requested in the many tasks which lie ahead of her.

Liaison between Universities and Industry

I would also like to refer briefly to Sir Charles Morris's talk at our Banquet, where he referred to the importance of the universities relative to industry.

I think there is a great opportunity for this Institution to work out a scheme whereby industries and universities can work closer together in their mutual interests. I submit that we still have to find the best way of "alloying" scientific knowledge to the "art" of application in industry.

Do we start first with the scientific knowledge and then subsequently train for industry, or do we train for industry and subsequently add the scientific knowledge, or do we sandwich the two training schemes together? It is clear that in industry it is essential to have men with certain qualities and abilities which can only be developed and tested whilst actually working in industry, it being appreciated, however, that there is an increasing demand for the scientific brain.

I would like now to refer to certain points which Sir Charles Goodeve made this morning.

He made a reference to the possible shortcomings of the small firms, but I would point out that over 80 per cent. of the engineering firms in this country employ less than 100 people.

It should always be appreciated, in referring to the larger organisations, how much they depend on these small firms, usually controlled by enthusiastic specialists who are able to respond quickly to the changing needs of larger industries.

The "pyramid" of production in this country has a very wide base made up of thousands of these small specialist firms, and if we take, as an example, the "Big Six" in the automobile industry, they rest entirely on this broad base of the small specialist firms.

As there are many of these small firms represented here at this Conference, I say to them that they are doing a wonderful job, and feel sure they will continue to do so.

Example Set by Small Firms

One other point which must be borne in mind by the larger industries is that they have much to learn from the small firms, particularly in regard to industrial relations and the human side of industry, as these small groups of people in the small firms have a better understanding of their purpose than is the case in many of the larger organisations.

There is no question, however, that the very fine paper which Sir Charles Goodeve has given us this morning is worth careful study by all who are engaged in production, and should be read word for word.

Time does not permit a full summary of this paper, but I would like to stress Sir Charles' simple wording relative to the activity of a factory, where he refers to the *size* of the factory relative to the *speed* at which the plant operates. I am sure that we all understand this basic reference.

Reference was made to the importance of re-equipping our factories and bringing our plant up to date, and much reference has been made in this Conference to the question of machine tools and the efficiency with which they remove material.

I feel, however, that our scientific studies and our research for the future should work with the idea of "leaving it off" instead of "machining it off". There is an increasing application today of new methods of producing parts to closer limits, such as shell moulding, waste wax casting, sintering, cold and hot heading, hot coining, and the use of permanent dies and moulds.

Surely the real objective of efficiency is to see how closely the weight of the raw material conforms to the weight of the finished article as, I submit, it must be regarded as inefficient and out of date to make heavy expenditures on plant and pay for the removal of metal in our machine shops and create expensive "swarf", which in turn has to be handled.

Double Shift Working

Sir Charles also referred to more efficient plant utilisation and the use of double shift working of expensive plant.

I note that in the U.S.A. and in Germany, there is a tendency now towards a double dayshift, which joins together two working shifts, thus leaving one full shift for plant maintenance and preventive maintenance. As you know, we in this country, work a dayshift and a nightshift with two short breaks which are insufficient for plant maintenance.

I feel that this is a subject to be openly discussed as I think we have maintained our traditional hours of working too long and we need to revise our ideas

on the question of premium time payment for workers, so that the maximum use is made of the 24 hours of each day without excessive premium payments, at the same time permitting a full maintenance shift.

I would now like to refer to Sir Hubert Houldsworth's address, as he, too, referred to the new outlook in the coal mines and to long-term planning.

It was good to hear his many references to the work of the Production Engineer in the coal mines.

Many of you who have been in our Institution over the years will remember that in the early days we endeavoured to broaden our activity and influence.

Many of the earlier papers which were read to the Institution were relative to "mass production", and particularly the application of mass production methods to the production of motor cars.

The old stalwarts of this Institution have always realised that the fundamental principles of Production Engineering could be applied throughout all industries, and it was good to see these principles being applied to one of our basic and essential industries.

There is no shortage of raw materials in the mining industry. It is all a question of men, machinery, and management.

Sir Hubert referred many times to "work study" in the coal mines, but I consider that individual human incentives are of equal importance. In fact I consider that incentives come before work study and job evaluation, as surely there must be the desire of the individual to apply the results of work study investigation and to use machinery to the maximum of efficiency.

In simple language, we require a lot more coal.

DISCUSSION GROUP REPORTS

I would now like to refer to the Discussion Groups —not so much to the subject-matter which was discussed, but to give an impression as to how these Groups worked.

First of all I found each one of the Discussion Groups full to capacity and also full of enthusiasm. The desire of most of the delegates to participate in the discussion was outstandingly good, proving the value of this type of Conference.

The real value of such a Conference is not to sit, as you are at the moment, and listen to someone like myself talk at you. The real value of a Conference is in its small groupings of people, all anxious to make their individual contribution, to give of their own experience and exchange ideas, and I do assure you that the Discussion Groups were exemplary in this respect.

I wish to pay tribute to the remarkable way in which the Discussion Group subjects were summed up by Mr. Kirkwood, Mr. Gilberthorpe, Professor Matthew, and Mr. Aiers. I thought their summing-up was really outstanding, and to me it represented one of the high spots of this Conference.

I have, however, another high spot to which I will refer later, and I will leave it to you to judge what was, in fact, the high spot of this Conference.

I say about those who organised this Conference, to the Chairmen of the Discussion Groups, the reporters, and those who have summed up, that all are to be highly complimented.

I am sure that all these good people who have voluntarily contributed to this Conference are also satisfied particularly with the work undertaken by the Discussion Groups, which represents the real heart of this Conference.

I found great good humour and goodwill in these Discussion Groups, proving the ability to have one's pet ideas and theories criticised and "torn to pieces" as it were, and yet I saw no signs of any surliness. All was taken in good part.

One of the objectives of such a Conference is to help our members to become more articulate, to say their "piece" in public, and to feel free in the use of words to describe the point which they are making.

CONFERENCE ORGANISATION AND INSTITUTION ACTIVITIES

I would like to make particular reference to Mr. Harold Burke, who is the Chairman of the Conference Organising Committee; to Mr. Aiers, the Chairman of the Conference Programme Committee; and to the Conference Reception Committee. All have done well.

I would also refer to the excellent work undertaken by the Headquarters staff and the pleasant and friendly way in which they have undertaken their many difficult tasks.

It must be an inspiration to all to know that practically the whole of the work was undertaken voluntarily right through from the Conference Committees to the Speakers and Discussion Groups, and this unselfish contribution to the Conference is, to my mind, a wonderful example.

A PERSONAL CONTRIBUTION

I would now like to conclude by making my own references to this Conference.

I say that this has been a grand Conference. I say that it is grand largely for the reasons which I have just made, namely, that it is in the main a voluntary Conference.

It is also grand because we have had the ladies with us. They have added charm to our proceedings and have graced our festive boards with their beauty.

Many references have been made to "team spirit" and this is another of these terms such as "tell the workers", "joint consultation" and so on.

I believe the managers of to-day, and particularly of the future, will need, more and more, to bring in to consultation not only the workers or their own supernumeraries, but also their colleagues and contemporaries. We must be brave in our ability to confer with our fellow man, whatever his station in life may be, so long as he can make a contribution to a particular objective.

I make this appeal, as we, in this activity of production and management, hear a great deal about

The Harrogate Conference

Left to right (top): Lord Swinton proposing the toast of "The Institution" at the Conference Banquet; Sir Charles Morris, Vice-Chancellor of the University of Leeds, who responded to the tost of "The Guests", with Mr. Harold Burke, Chairman of Council; Mr. F. T. Nurrish, President of the Yorkshire Section; (centre) Discussion Group 'B (i)', dealing with the promotion of closer collaboration between designer and production engineer, is addressed by the Chairman, Mr. H. Spencer Smith; (bottom) Mr. W. F. S. Woodford, Secretary of the Institution, with Mrs. Woodford; Mr. P. O. Fabiyi, of Nigeria; Mr. E. G. Gordon England (right) listens to the Discussion on 'Cost Consciousness'.

joint consultation *within* industry. I feel, however, that there is an opportunity for outside bodies to have more joint consultation *with* industry.

Consultation with Industry

Sir Charles Goodeve, this morning, gave many examples of where old-fashioned national legislation is crippling the attempt to increase productivity, and I submit that much of this is due to lack of consultation *with* industry in a free atmosphere where ordinary commonsense could be applied.

Much has been said about the two sides of industry, but what about the two sides of the country, and I refer here to the two political sides.

We have to be very careful that because a good suggestion is made by someone wearing a blue tie, it is not automatically countered by someone wearing a red tie, or *vice versa*. This is particularly important in industry, as it is, in so many cases, harnessed to national legislation.

We must all realise that over 98 per cent. of the people living in these islands are British. This should be an important overriding factor in our outlook towards increasing production, as there must be no two sides or two minds about the need for increasing production.

We must endeavour to avoid automatically opposing each other because of our different coloured ties, and I say for Heaven's sake let this grand British population work together on all the major issues affecting the national prosperity and progress.

The Basic Services

Industry depends entirely on the main basic products and these surely should receive the major interest in all our discussions on "Production for Plenty". What use is there in having well-equipped production shops, machine tools, plant and equipment, unless there is a good supply (at an adequate price) of coal, gas and electricity plus an efficiently run transport system?

We have had many views expressed at this Conference in connection with coal, which, in turn, gives us the gas, but what about electricity? How many times do we hear that the U.S.A. has many times the horse-power per man of electricity and power as compared with this country?

If we are going to increase our horse-power per man, then we require more and cheaper coal, and in turn more and cheaper electricity, and I submit that this is basic to the whole of our productivity.

Certain references have been made to highly efficient machines with push-button controls, etc., but how very much more frequently do we see manual work being undertaken which could be more easily dealt with many times over by electric power?

It is even said that the British worker does not work so hard as his American counterpart. In general terms I regard this as "rubbish", whilst there is this wide discrepancy of horse-power available.

(Here Mr. Hancock gave a graphic illustration of the physical exertion of a man lifting a part, and then an illustration of an American worker pulling a lever and lifting 500 tons.)

No use is served by shouting at people. This question of basic supplies is fundamental and it is a problem for the leaders of this country to solve, and if we are fearless and genuinely have high level consultations, I believe we can find a solution to our basic problems of "Production for Plenty".

A review of the month of May of production of "cars" and "coal" has a bearing on this point as, when materials were freed to the car industry, the output immediately rose without any change of methods, plant or equipment.

Transport—The Fundamental Need

It is important that I make reference to the fourth basic industry, namely transport.

When we realise how important road transport is to industry, and the vast tonnage of varieties of materials that have to be moved hour by hour and day by day on our roads, we sometimes overlook the fact that this is fundamental to increased productivity.

I submit that many of the scientific references which have been made at this Conference, such as "work study" and "job evaluation", should be applied to our road transport.

A study of the main road from London to Coventry and Birmingham, with its bottlenecks, its narrow twisting roads, villages with a speed limit of 15 m.p.h., is one example of the unsatisfactory road conditions.

Another example would be to study all the level crossings over our roads and the thousands of idle hours of lorries waiting for the gates to open.

These two examples indicate how completely out-of-date we are relative to one of our main and basic transport activities essential to "Production for Plenty".

Sir Charles Goodeve made it clear that he felt the restriction of lorry speeds was interfering with production, with which view I agree. Nevertheless, we do see lorries running at higher speeds than the limit, although their overall time is extremely low and this, I submit, is because of these restrictions at various points in our main arterial roads, and lorries travelling at 40 m.p.h. only do so in order to make an overall average of 18/20 m.p.h.

I regard our road systems from the industrial point of view as a national disgrace.

The Country's Capital

One other general reference which I would like to make on this whole theme is to define what is the capital of a country.

I submit that it is not the weight of gold held in the cellars of our banks, as this, to my mind, is "dead" capital.

I submit that the capital of a country is in its peoples—the maximum number of man, woman and youth hours that are worked day by day, week by week, and year by year. This, to my mind, is "live" capital.

A visit to some of the defeated countries in Europe

and the speed with which they have rebuilt themselves indicates that we, as Sir Cecil Weir says, dare not be complacent.

"Production for Plenty"—what does this mean? Does it mean the production of plenty by plenty for plenty? This is my interpretation, as the greater number of our population who work objectively, the greater will be the output form the country, as constructive and objective work is a good national habit anyway.

We must, however, be very careful that we do not mean production of plenty by a few for plenty. In other words, these islands of ours must not have said about them that never did so few produce so much for so many.

I refer here to the rising numbers of our national administrators—such groups as the Inland Revenue, the social services, and so forth. A review of the past shows that the social services employ some 62 times more people than they did 50 years ago.

The Conference High Spot

My final reference is to what I consider was the high spot of the Conference, and I leave it to you to choose as to whether this or the summing-up of the Discussion Groups represents the peak.

During my visits round the Groups, I paused at one which had just reached the stage where delegates were saying the same thing in different ways and then, all of a sudden, a young man stood up.

He put four points to the Group which immediately broadened the whole atmosphere of the discussion, and in so doing he let in a gust of "clean fresh air".

This young man said that he had not intended to speak, but because of the kindly atmosphere created by the Chairman, he did in fact speak and spoke very well indeed.

This to me indicated the ideal purpose of a Conference—where a young man did not intend to speak, but did in fact speak and made a valuable contribution.

I say to all young men that you should never be afraid to speak either at a Conference or in the society of your fellow men. You have a great contribution to make, and only by the spoken word can your contribution become genuine.

Encourage the Young Men

Much nonsense is talked to-day as to whether our youth is as good as it used to be. I say that the youth of today is as good as ever, but if it should be felt by an ageing individual that there is something wrong with youth, then it is the adults' fault in not giving youth the necessary encouragement and opportunity.

How often is it said that a man is too young at 35?

I submit that we must give men responsible jobs at the age of 28 to 30. Let them dive into the "deep end" of industrial responsibility. I agree that they will perhaps have a few mouthfuls of "salt water", but this will do them good, because I know the youth of this country can take it and survive.

I appeal to higher management to give the young man his opportunity.

In conclusion I would say this — that I have attempted to sum up this whole Conference not so much in specific detail but by general references, and I feel that the purpose of this Conference will have been served if, on Monday next, we resume our daily tasks with fresh hearts and with more inspired thinking, not only in the interests of our own selfish objectives, but in the overall interests of our fellowmen.

Corrigenda

THE SIR ALFRED HERBERT PAPER, 1953

The attention of members is drawn to the following corrections to the Paper on "The Industrial Applications of Radioactive Materials" by Sir John Cockcroft, which appeared in the August issue of the Journal:—

Page 348, righthand column, last line:
"constitution" should read "constituent".

Page 348, righthand column, line 5:
"underground cells" should read "underground cables".

Page 353. Acknowledgments are due to "Nucleonics", from which Figs. 15, 16 and 26 are reproduced.

Harrogate Conference—Second Plenary Session

(*concluded from page* 385)

are seen, and the unfortunate fact is that the needs of the country for coal to-day are such as to make all of us impatient that the results which are so urgently required cannot be accelerated to a greater degree. We have to provide for the present as well as for the future, and that is one of our difficulties, because there is a tug-o'-war between the effort and the endeavour required to get the coal which is needed now, and similar effort and endeavour which are required for the reconstruction of this industry, not merely physically but in outlook as well, in order to meet the requirements of the future.

SCHOFIELD TRAVEL SCHOLARSHIPS 1954

THE Institution is pleased to announce that applications are now invited for the 1954 Schofield Travel Scholarships.

It is intended to offer two Scholarships for 1954, which will entitle the successful Graduates to visit selected European countries for industrial study visits of from three to six months' duration. Each Scholar will have an opportunity of carrying out his project in one or more firms.

Objects of the Scholarship Scheme

(i) To provide facilities whereby young Production Engineers are given an opportunity of broadening their outlook and of improving their knowledge of production functions, both technical and managerial.

(ii) To improve productivity in this country by the implementation and dissemination of such knowledge.

(iii) To stimulate interest in production by offering these facilities.

(iv) To help to foster a better understanding of the modes of life, social conditions and, in particular, of the production methods employed in the industries of European countries and of such other countries as may from time to time be practicable.

Conditions for the 1954 Scholarships

(i) Two Scholarships will be offered, covering a period of from three to six months, the period to be determined at the discretion of the Institution's Education Committee, after consultation with the successful candidates and their employers. Council reserve the right to make no award if the entries are not considered to be of sufficiently high standard.

(ii) Graduates of the Institution entering for the Scholarships must have attained their 23rd birthday, but not have passed their 30th birthday, on 1st January, 1954.

(iii) Application forms may be obtained from the Head Office of the Institution or from Section Honorary Secretaries and should be completed and returned by candidates not later than ***Monday, 12th October, 1953.***

(iv) Successful candidates will be required to devote the whole of their time abroad to the project which they have selected. On their return they will be required to read a paper at a special meeting in their Sections.

(v) Graduates entering for the award this year who are unsuccessful may enter for future awards, subject to the particular conditions then in force.

Selection Procedure

(i) Preliminary selection will be carried out by Section Committees.

(ii) Candidates who are successful at this preliminary stage will proceed to the next stage, which involves the preparation of an essay on the project which they propose to carry out if awarded a Scholarship.

Such essays should include a background of the candidates' knowledge and experience, sufficiently detailed to illustrate their ability to make a profitable investigation of their selected subjects.

The projects should have a direct bearing on production and in particular on that aspect of it with which the candidate is concerned at the time of entering for the award.

When submitting their projects, candidates will be required to furnish a statement from their employers certifying that, in the event of being selected for a Scholarship, they will be granted the necessary leave of absence.

In this connection, the Institution will, if required by candidates, communicate with their employers if this will assist candidates in obtaining support.

(iii) After assessment of the projects submitted, selected candidates will be invited to attend a final group interview.

The Scholarships are among the most valuable awards in the engineering field, and are unique in the opportunities which they offer qualified Graduates to obtain varied production experience in projects of their own selection.

Quite apart from the financial value of the awards, there can be no doubt that the experience gained provides the successful candidates with a background of knowledge, both of production techniques and human relations, which will be of inestimable value in their future careers.

Naturally the Selection Committee seeks in candidates the qualities which will enable them to obtain the maximum benefit from the awards, but it cannot be emphasised too strongly that personal qualities are considered to be at least of equal importance to academic and industrial attainments.

REPORT OF THE MEETING OF COUNCIL

Thursday, 23rd July, 1953.

THE first Council Meeting of the 1953/54 Session took place at 36, Portman Square, London, W.1, on Thursday, 23rd July, 1953. Mr. Harold Burke, Chairman of Council, presided over the Meeting, which was attended by 32 members. Also present were Mr. G. Horner, Chairman of the Yorkshire Graduate Section and Mr. E. Springthorpe, Chairman of the Wolverhampton Graduate Section.

The Chairman opened the proceedings by welcoming the new members of Council.

British Productivity Council

A number of Section representatives reported that Productivity Committees had already been formed in their particular areas, and that the Institution had been represented at initial meetings. There was a general feeling among members, however, that progress was not being made as quickly as had been envisaged and, after some discussion, Council asked Sections to forward their views to the Research Committee, who would then draft a memorandum that could be submitted to the British Productivity Council for use on a national basis.

New Building Appeal

The Chairman informed Council that the New Building Appeal, which had been launched the previous week, was already beginning to show results. (The first list of members and companies who have contributed to the Appeal appears ons 408 and 409.

Dr. H. Schofield, C.B.E.

The Chairman reported with regret that Dr. H. Schofield, as a result of his recent illness, had tendered his resignation from the F. & G. P. Committee. It was unanimously agreed that the Secretary, on behalf of Council, should convey to Dr. Schofield their pleasure that he was making a good recovery.

Harrogate Conference

The Secretary reported that approximately 350 members and guests had attended the Harrogate Conference. Despite a drop in numbers, the opinion had been expressed by many members that the general level of the addresses and discussions was higher than at previous Conferences.

Articles of Association

The amendments to the Articles of Association which were agreed at the last Council Meeting had been submitted to the Board of Trade for approval, following which the amendments would be submitted to a General Meeting of the Institution.

Broadening the Base

Mr. E. P. Edwards informed Council that the Report of the "Broadening of the Base" Sub-Committee had now been completed by the Education and Membership Committees, and would be circulated to Sections for consideration before being presented to Council.

Election of Standing Committees

The names of members elected to Standing Committees for 1953/54 appear on page 407.

Intermediate Associate Membership

The Secretary reminded Council that this grade of membership had ceased to exist on 30th June, 1952. The majority of Intermediate Associate Members had now been transferred to Associate Membership, but a few had failed to take advantage of the special provisions for transfer, and their names had been removed from the register.

Education

The Education Committee were pleased to report that the Institution of Mechanical Engineers had agreed to recognise subjects taken in the Institution's Associate Membership examination, as providing exemption from equivalent subjects in the Associate Membership examination of their own Institution.

Council approved the Education Committee's recommendation that Mr. R. Shilton be nominated as the Institution's representative on the Mechanical Engineering Committee of the Yorkshire Council for Further Education for a further period of three years. Council also approved the Committee's recommendation that Mr. F. W. Cranmer be nominated as the Institution's representative on the Engineering Advisory Committee of the Royal Technical College, Salford, for a further period of three years.

The Journal

The Editorial Committee were pleased to report that the Journal in its new form continued to make progress.

Papers

Council decided to make the following awards for 1951/52:-

Institution Medal for Member, 1951/52

Mr. A. Cameron, A.M.I.Prod.E., Works Director of Victor Products (Wallsend) Ltd., for his Paper "Increased Productivity by Workshop Practice".

Institution Medal for Non-Member, 1951/52

Dr. J. D. Jevons, B.Sc., F.R.I.C., F.I.M., Chief Metallurgist, Joseph Lucas Ltd., for his Paper "How the Production Engineer can be helped by the Metallurgist".

Hutchinson Memorial Award, 1952

Mr. J. E. Poulter, Grad.I.Prod.E., Ceramic Development Engineer, Industrial Ceramics Division, Doulton & Co. Ltd., London, for his Paper " Industrial Application of Porous Ceramics ".

The Secretary drew Council's attention to the fact that this would be the second occasion on which Dr. Jevons had received the Non-Member's Award, and it was agreed that the Council's appreciation should be conveyed to Dr. Jevons for his valuable contribution to the Institution's Proceedings.

Hazleton Memorial Library

The Quarterly Report of the Library Committee, which was presented by the Chairman, Lord Sempill, emphasised that, although members in all parts of the country were giving great help in abstracting and reviewing books, further assistance was needed. Members willing to help in this important work were asked to get in touch with the Librarian, stating the subjects in which they were interested.

Formation of New Sub-Section

Council approved the recommendation of the F. & G. P. Committee that a Sub-Section be established in Worcester.

Research

Mr. B. H. Dyson asked Section Presidents to assist the Sub-Committee investigating Materials Utilisation by encouraging the formation of Working Groups for the preparation of Case Studies.

Applications for Membership and Transfer

Council approved a number of applications for membership and transfer. Particulars appear on pages 402-404.

Local Section Reports

Council adopted the Local Section Reports, extracts from which appear on pages 404-407.

Standards

The Standards Committee reported that they had received, with great regret, the resignation of Mr. C. R. Whitaker, on his retirement and departure for Australia. Mr. Whitaker had been an active member of the Committee for many years.

Council Elections

Council approved the F. & G. P. Committee's recommendation that information circulated with the ballot paper for the election of members to Council should include details of attendances at Council Meetings in respect of those members standing for re-election.

Section Hon. Secretaries

The election of the following Section Hon. Secretaries was confirmed :-

ADELAIDE	W. L. Hemer
BOMBAY (Acting)	Mrs. S. G. Barbet
DUNDEE	K. Fairweather
EASTERN COUNTIES	A. B. Brook
GLOUCESTER & DISTRICT SUB-SECTION	P. C. Bradshaw
HALIFAX GRADUATE	C. W. Overin
LIVERPOOL GRADUATE ...	T. L. Henthorne
LONDON GRADUATE	L. J. Saunders
LUTON	J. F. W. Galyer
LUTON GRADUATE	F. G. Ethelston
MANCHESTER	G. R. Parker
MELBOURNE	R. W. Deutsher
NORTH EASTERN	G. D. Robinson
NORTH EASTERN GRADUATE	R. F. Loebl
NORWICH SUB-SECTION ...	L. D. R. Dunsford
OXFORD SECTION	M. J. Inston
PETERBOROUGH SUB-SECTION	E. G. Perrett
PRESTON	F. T. Graham
WOLVERHAMPTON	W. B. Pamment
YORKSHIRE GRADUATE ...	G. C. Wadsworth

Obituary

The deaths of the following members were recorded with regret :-

J. Harris, A.M.I.Prod.E.
S. R. Hill, A.M.I.Prod.E.
E. J. Johnson, M.I.Prod.E.
A. F. Law, A.M.I.Prod.E.
R. T. McArthur, A.M.I.Prod.E.
V. J. H. Morgan, A.M.I.Prod.E.
M. E. Smith, M.I.Prod.E.
T. A. Stevens, M.I.Prod.E.
W. Symed, Affiliated Representative

Date and Place of Next Meeting

Thursday, 29th October, 1953, at 11 a.m., at 36, Portman Square, London, W.1.

ELECTION OF MEMBERS

23rd July, 1953

ADELAIDE SECTION

AS ASSOCIATE
R. T. Elvish.

AS GRADUATE
W. K. Healey.

TRANSFER
FROM GRADUATE TO ASSOCIATE MEMBER
P. A. Wibrow.

BIRMINGHAM SECTION

AS ASSOCIATE MEMBERS
B. H. Hill, T. Viswanath.

AS GRADUATES
D. F. Allen, F. H. Brettle, J. R. Brownsword, S. K. R. Chowdhury, H. Chanda, R. W. Collins, J. E. Cross, F. Farnworth, D. Horrex, M. A. Lloyd-Morris, L. G. Mallabond, A. D. Reeves, D. L. Taylor, P. J. Webber, N. Whitehead.

AS STUDENTS
R. B. Bristoll, A. F. Pate, G. Pettit, C. J. Stanford, S. G. Tomes, M. S. Woolston.

TRANSFERS
FROM ASSOCIATE MEMBER TO MEMBER
B. W. Gould, A. G. Jennings.

FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
J. K. Evans, R. E. W. Smith.

FROM GRADUATE TO ASSOCIATE MEMBER
A. G. Bradbury, R. V. Brown, R. A. Hennery, R. E. Green.

FROM STUDENT TO GRADUATE
M. J. Bealing.

BOMBAY SECTION

AS ASSOCIATE MEMBER
R. V. Kulkarni.

AS STUDENTS
H. L. Khanna, R. N. Prasad, C. P. Virmani.

TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
H. C. Ramanna.

FROM GRADUATE TO ASSOCIATE MEMBER
M. Sondhi.

CALCUTTA SECTION

AS MEMBER
E. J. Bookless.

AS ASSOCIATE MEMBERS
S. Bhattacharya, J. Lawson, S. D. Malhotra, B. Mookerjee.

AS ASSOCIATE
S. Raghaviah.

AS GRADUATES
B. P. Bannerjee, S. Jana.

AS STUDENTS
K. P. Acharyya, A. J. Roychowdhury, V. Sinha.

CORNWALL SECTION

AS STUDENT
E. J. Sandoe.
TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
L. Holman, E. Pearce.
FROM STUDENT TO GRADUATE
J. F. Horler.

COVENTRY SECTION

AS ASSOCIATE MEMBERS
K. J. Darbey, N. S. Hardy, E. Strong, H. J. Thorneycroft, E. M. Vaughan.
AS GRADUATE
G. T. Jordan.
AS STUDENT
D. P. Stratton.
TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
E. N. Cooper, H. Randle, H. Standring.
FROM GRADUATE TO ASSOCIATE MEMBER
D. W. Wood.

DERBY SECTION

AS GRADUATE
V. O. Williamson.
AS STUDENTS
J. E. Priestman, F. A. Swain.
TRANSFERS
FROM GRADUATE TO ASSOCIATE MEMBER
N. W. Walker.
FROM STUDENT TO GRADUATE
D. Bourne-Mortlock.

EASTERN COUNTIES SECTION

AS ASSOCIATE MEMBER
R. P. Brown.
AS GRADUATE
J. P. Pereira.
AS STUDENTS
M. B. Conyers, J. I. Hilder.
TRANSFER
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
L. A. Tillett.

EDINBURGH SECTION

AS GRADUATE
G. Gillies.
TRANSFERS
FROM ASSOCIATE MEMBER TO MEMBER
A. F. Muir.
FROM GRADUATE TO ASSOCIATE MEMBER
J. W. Haig Ferguson.

GLASGOW SECTION

AS ASSOCIATE MEMBER
G. M. Anderson.
AS ASSOCIATES
A. D. Mackay.
E. S. Dunthorne.
AS STUDENTS
R. Carrie, H. Ehtisham.
TRANSFERS
FROM ASSOCIATE MEMBER TO MEMBER
D. A. Smith.
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
C. W. Love.
FROM GRADUATE TO ASSOCIATE MEMBER
D. C. Muirhead, D. Wooldridge.

HALIFAX SECTION

AS STUDENT
A. D. Bailey.
TRANSFERS
FROM GRADUATE TO ASSOCIATE MEMBER
M. Kenyon, J. E. Senior.

LEICESTER SECTION

AS MEMBERS
A. I. Baker, E. W. Marvill.
AS ASSOCIATE MEMBER
W. G. Wright.
AS GRADUATES
D. D. Billsdon, E. E. Hopwell, E. Kent, W. A. Smith.
AS STUDENTS
A. G. Crossland, K. H. Gollaglee, D. F. Gricks, S. L. Heys, N. Hodgson, M. H. Parkinson, D. G. J. Swinfield, K. F. Webb.
TRANSFER
FROM GRADUATE TO ASSOCIATE MEMBER
L. W. Hampton.

LINCOLN SECTION

AS STUDENTS
B. O. Hinitt, G. F. Howden, S. V. Page, R. W. Periam.
TRANSFER
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
T. H. Goddard.

LIVERPOOL SECTION

AS MEMBER
G. P. Belsham.
AS ASSOCIATE MEMBER
J. Fletcher.
AS GRADUATE
G. K. McNair.
AS STUDENT
G. Hesketh.
TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
C. Phillips.
FROM GRADUATE TO ASSOCIATE MEMBER
J. Palmer, R. T. Ridgeway, C. T. Wheatcroft.

LONDON SECTION

AS MEMBERS
A. MacNiven-Brown, L. V. Store.
AS ASSOCIATE MEMBERS
L. G. Beeton, S. R. H. Bolton, L. M. Brooks, A. N. Byford, C. E. Channing, R. E. Charman, A. J. S. Dadson, D. E. Davis, J. C. Gayler, H. Kearl, C. R. Last, G. Moyes, J. W. Rose, R. E. Spratt, F. J. Willmott.
AS AS SOCIATE
W. J. S. Hunter
AS GRADUATES
P. A. Coker, L. B. Dove, J. W. Kirkby, R. Solt, R. H. Wall, J. T. Wholey.
AS STUDENTS
F. Haslam, R. P. Hills, C. F. Noble, D. H. Ralston, P. R. Smithers.
AFFILIATED FIRM
Acheson Colloids Ltd.
CHANGE OF AFFILIATE REPRESENTATIVE
T. D. Ough.
TRANSFERS
FROM ASSOCIATE MEMBER TO MEMBER
J. W. H. Smith, J. G. Woodruff.
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
R. R. Constable, R. A. Farman, L. E. Holton, R. A. Spencer.
FROM GRADUATE TO ASSOCIATE MEMBER
R. W. Clark, N. E. Cornish, L. Gold, P. H. J. Johnson.
FROM STUDENT TO GRADUATE
V. F. Burgess, J. L. Blumire, R. King, K. D. H. Willcocks, P. J. Simner.

LUTON SECTION

AS ASSOCIATE MEMBER
P. J. C. Chant.
AS GRADUATES
N. M. Panikkar, C. R. Shotbolt, A. E. Willett.
AS STUDENT
R. G. Pitkin.
TRANSFER
FROM GRADUATE TO ASSOCIATE MEMBER
G. F. McCormick.

MANCHESTER SECTION

AS ASSOCIATE MEMBER
J. M. Abbott.
AS GRADUATES
S. N. Haque, R. A. Jones, J. D. Pennington, A. R. Sheikh.
AS STUDENTS
G. R. Connor, M. Sykes.
AFFILIATED FIRM
F. E. Rowland & Co., Ltd.
CHANGE OF AFFILIATE REPRESENTATIVE
J. Barton.
TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
P. Haigh, N. Haynes.
FROM GRADUATE TO ASSOCIATE MEMBER
R. D. Billing.

MELBOURNE SECTION

AS MEMBER
H. H. Hoch.
TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
C. R. Nuttall, E. G. Vincent.
FROM GRADUATE TO ASSOCIATE MEMBER
E. H. Werner.

NEW ZEALAND SECTION

AS GRADUATE
D. C. McDonald.

NORTH EASTERN SECTION

AS MEMBERS
E. G. Angus, T. H. Hall.
AS ASSOCIATE MEMBERS
S. R. Kilner, H. Przibram.
AS GRADUATE
H. C. Trueman.
TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
H. Roberts.
FROM GRADUATE TO ASSOCIATE MEMBER
J. Pearce.

NORTHERN IRELAND SECTION

AS ASSOCIATE MEMBERS
T. A. Calhoun, C. T. Chapman.

NOTTINGHAM SECTION

AS ASSOCIATE MEMBER
G. E. Pollard.
AS STUDENTS
R. C. Cattell, K. E. Clavering.
TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
J. W. Reynolds.
FROM GRADUATE TO ASSOCIATE MEMBER
J. J. Adams, D. F. Worthington.

OXFORD SUB-SECTION

AS ASSOCIATE MEMBERS
F. S. Chappell, G. A. Reuter, H. Taylor.
AS GRADUATE
J. F. P. Cheetham.

PRESTON SECTION

AS STUDENTS
V. Burton, J. A. Ensor, C. F. Holding, W. B. Howarth, J. Mills, J. Sankson, A. Wren.
TRANSFERS
FROM GRADUATE TO ASSOCIATE MEMBER
J. W. Freeman, J. Lyon, H. Prescott.

READING SECTION

AS GRADUATES
B. G. Hill, J. Wastling.
AS STUDENT
M. J. A. Mullett.
TRANSFER
FROM GRADUATE TO ASSOCIATE MEMBER
P. J. Smallbone.

ROCHESTER SUB-SECTION

AS ASSOCIATE MEMBER
F. A. Clements.
AS ASSOCIATE
R. G. Dodd.

SHEFFIELD SECTION

AS ASSOCIATE MEMBER
K. E. Gregory.
AS GRADUATE
W. A. Reeve.
AS STUDENTS
R. Foster, A. D. Hopkinson.
TRANSFER
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
H. Woodham.

SHREWSBURY SECTION

AS MEMBER
M. L. Curtis.
AS ASSOCIATE MEMBERS
W. M. Buchan, T. H. Fraser.
AS STUDENTS
F. R. Collinson, F. J. D. Thompson.

SOUTHERN SECTION

AS ASSOCIATE MEMBERS
A. O. Mattocks, R. H. Wozencroft.
AS STUDENTS
A. H. M. Ali, J. F. Clarke.

SOUTH AFRICA SECTION

AS ASSOCIATE MEMBERS
R. M. Clark, P. C. Ellett, C. J. Mogford, A. H. Smith.
AS GRADUATE
J. L. Neethling.
TRANSFER
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
C. Adderley.

SOUTH ESSEX SUB-SECTION

AS ASSOCIATE MEMBERS
F. L. Barker, A. E. H. Chaplin, S. R. Goddard.
TRANSFER
FROM GRADUATE TO ASSOCIATE MEMBER
D. G. Mickleburgh.

STOKE-ON-TRENT SUB-SECTION

AS MEMBER
C. J. Tirrell.
TRANSFER
FROM GRADUATE TO ASSOCIATE MEMBER
A. N. Smith.

SYDNEY SECTION

AS MEMBER
R. C. Neave.
AS ASSOCIATE MEMBER
R. J. Barry.
AS GRADUATES
G. Bennett, D. J. Fakes.
AS STUDENTS
P. Major, D. A. King.
TRANSFER
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
L. T. Alexander.

WESTERN SECTION

AS ASSOCIATE MEMBER
J. R. Laidlaw.
AS ASSOCIATE
G. W. Bubb.
AS GRADUATE
D. F. Ormrod.
AS STUDENT
C. R. Blake.
TRANSFERS
FROM ASSOCIATE MEMBER TO MEMBER
F. G. C. Sandiford, W. U. Snell.
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
R. G. Moseley, F. Starr.
FROM GRADUATE TO ASSOCIATE MEMBER
N. W. Taylor.

WEST WALES SECTION

AS STUDENTS
H. W. Phillips, T. M. James, D. Jenkins.
NEW AFFILIATED FIRM
Rees & Kirby Ltd.
NEW AFFILIATE REPRESENTATIVES
W. S. Whinham, T. J. Lehane.

WOLVERHAMPTON SECTION

AS GRADUATE
R. J. Evans.
AS STUDENT
A. G. Davies.
TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER

F. F. Halbard.
FROM GRADUATE TO ASSOCIATE MEMBER
R. S. Ayers, H. Haigh, C. E. Henden.
FROM STUDENT TO GRADUATE
R. J. Gentle, B. McCloskey.

YORKSHIRE SECTION
AS MEMBERS
D. F. Newstead.
AS ASSOCIATE MEMBERS
E. A. Brearley, J. Kirkby.
AS ASSOCIATE
B. Crowther.
AS GRADUATES
G. Ackroyd, N. Jackson.
AS STUDENTS
R. E. H. Bayford, R. D. Bourne, A. Fowell, J. T. Wilkinson, F. Whitaker.
TRANSFER
FROM ASSOCIATE MEMBER TO MEMBER
P. B. Higgins.
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
G. H. Fisher.

NO SECTION
AS MEMBERS
O. H. Kienzle, W. R. Turner.
AS ASSOCIATE MEMBERS
A. Nuedzwiedzki, A. E. Walmsley.
AS GRADUATE — AS STUDENT
J. Hobson. — F. R. Taylor.
TRANSFERS
FROM INTERMEDIATE ASSOCIATE MEMBER TO ASSOCIATE MEMBER
W. J. Murfin.
FROM GRADUATE TO ASSOCIATE MEMBER
S. W. W. Carroll, M. C. Pobjoy, J. K. H. Smith.

SUCCESSFUL CANDIDATES IN 1953 ASSOCIATE MEMBERSHIP EXAMINATION

BIRMINGHAM SECTION
AS ASSOCIATE MEMBER — AS GRADUATE
A. Hambly. — W. Evans.
TRANSFER
FROM STUDENT TO GRADUATE
A. V. Sullivan.

COVENTRY SECTION
AS ASSOCIATE MEMBER
W. T. White.

DERBY SECTION
AS GRADUATE
T. A. Clarke.
TRANSFER
FROM STUDENT TO GRADUATE
F. G. Passam.

GLASGOW SECTION
AS GRADUATE
C. R. Webster.

LONDON SECTION
AS ASSOCIATE MEMBERS
F. H. Briggs, H. P. Browne, H. F. Rudkin.
AS GRADUATE
N. J. Rippingham, T. Tebbutt, F. C. Munns.

LIVERPOOL SECTION
AS ASSOCIATE MEMBER
J. H. Lynn.

MANCHESTER SECTION
AS ASSOCIATE MEMBER — AS GRADUATE
S. W. P. Hugo. — H. A. Blomiley.

NORTH EASTERN SECTION
AS GRADUATE
J. Corker.

PRESTON SECTION
AS ASSOCIATE MEMBER
J. Doyle.

READING SECTION
AS ASSOCIATE MEMBER
E. P. Harrison.

ROCHESTER SUB-SECTION
AS GRADUATE
J. F. Mullervy.

SHEFFIELD SECTION
AS ASSOCIATE MEMBER
J. F. Spencer.
TRANSFER
FROM STUDENT TO GRADUATE
S. Brown.

SOUTHERN SECTION
AS ASSOCIATE MEMBER
R. Stewart.

SOUTH WALES SECTION
AS ASSOCIATE MEMBER
C. H. Hunt.

WESTERN SECTION
AS GRADUATE
H. J. Manners.

WEST WALES SECTION
AS ASSOCIATE MEMBER
R. T. Pritchard.

YORKSHIRE SECTION
TRANSFER
FROM STUDENT TO GRADUATE
D. Chappell.

NO SECTION
AS GRADUATE
S. Eilon.

EXTRACTS FROM LOCAL SECTION REPORTS

Presented to Council, 23rd July, 1953.

Adelaide

In conjunction with the Department of Industrial Development and the Australian Institute of Management, a Seminar was conducted under the leadership of Dr. Leinweber, a visiting consultant, on the subject of "Problems in Production Management". In April, a paper on "The Application of Hidden Arc Welding" was read by Mr. M. W. Wright, and at the May meeting, Mr. E. M. Schroeder, A.M.S.O.C., A.I.E.Aust., gave a lecture on "The Production of Cement". At the June meeting, three members of the Committee will speak on "A Survey of World Trends in Machine Tools".

Birmingham

The lecture session just concluded has been one of the most extensive arranged by the Section, and has included joint meetings with kindred associations and meetings held in the Birmingham University. Following the two lectures held in Worcester, a meeting of all members in this area was held in March. An Acting Secretary and a Provisional Committee were elected to help in planning future arrangements and to consider the establishment of a Sub-Section in Worcester.

As arranged by the Midland Region Committee, details of programmes in Birmingham, Coventry, Wolverhampton and Shrewsbury will be printed in a combined programme card.

It has been decided to establish an educational sub-committee and this will be set up during September, prior to the commencement of the 1953/54 Session.

Bombay

At the Meeting held in May, Mr. S. G. Barbet, A.M.I.Prod.E., read a paper on "The Future of Production Engineering", which had been presented in London by Mr. C. R. Whitaker, M.I.Prod.E. Some lively discussion ensued, in which the marked differences between conditions in England and India were stressed.

Meetings of the Membership and Activities Sub-Committee were held in May, and the last meeting of the present General Committee was held on 22nd May, when votes of thanks were passed to the retiring officers.

Applications for membership continue to be received at a satisfactory rate.

Calcutta

Committee Meetings were held on 31st March and 14th April, and the Annual General Meeting took place on 30th April.

The Ministry of Education at New Delhi have requested a meeting with the Section Committee in Calcutta to discuss the possibility of the Institution giving assistance with regard to Production Engineering Courses. Further discussions have also taken place with the Institute of Technology at Sindri and Kharagpur.

Canada

Mr. J. Coomber, of International Business Machines, Toronto, gave an interesting lecture on "Tool Engineering As An Aid To Production" on 15th April, followed by a lively discussion. This concluded the 1952/53 Session and the Committee look forward to an interesting series of lectures during the coming Session.

The Chairman and Secretary met officials of the University of Toronto recently and discussed Production Engineering Courses.

Cornwall

The Annual General Meeting held in March was very well attended. Captain F. W. Spencer was re-elected Section President for the year 1953/54, and Mr. H. M. Sawyer, President-Elect. After the meeting, Mr. F. G. S. English, M.I.Prod.E., presented a paper entitled "The Measure of Progress", followed by discussion.

In April, an interesting paper on "Induction Heating" was given by Mr. J. Lewis.

Coventry Graduate

The last meeting of the lecture season was held in April, and consisted of a film evening, followed by the Annual General Meeting, which resulted in seven new members being elected to the Committee.

In planning next year's lecture session, joint meetings have been held with representatives of Graduate Sections of other Institutions in Coventry, so that a clash of dates can be avoided as far as possible.

As a result of the recent ballot among Graduate Sections, it has been decided that the 1954 Graduate Conference will be organised by the Coventry Graduate Section.

Derby

The final lecture meeting of the 1952/53 Session was arranged on the subject of Textile Engineering, in line with "broadening the base", and for the particular interest of members in the Burton-on-Trent area.

The attendance at lecture meetings throughout the Session maintained a good average, the bulk of the attendance being senior members. It is hoped in the future to be able to persuade the local Technical College that the lecture meeetings would form part of the curriculum for Production Engineering Courses, particularly for those taking the final year of the Higher National Certificate or Endorsement Courses, and that the Principal will allow complete classes to attend lecture meetings if the date coincides with a normal attendance night at the College.

Mr. T. Broome has completed his term of office as President of the Section, and the Committee and Section Members wish to make a sincere expression of appreciation for the encouragement and guidance given to the Derby Section by Mr. Broome during its first two years as a full Section. The Section are extremely pleased to welcome Mr. A. F. Kelley as the new President.

Eastern Counties

Since the end of the 1952/53 Session, the Committee have been preparing the lecture programme for the coming winter. The lectures are being chosen so as to be representative of local industries. A different lecture hall has been obtained, and it is hoped that the facilities there will be more convenient for members and friends.

The Section Summer Visit was made on 12th June, to the Newall Engineering Co. Ltd., Peterborough, and those present spent a most enjoyable day.

Halifax

Activity in the Section at this time of year is confined to the work of the Committee; this is receiving every attention, and it is expected that the completed programme for 1953/54 will have something of interest for every member.

Lincoln

The resignation from the Section Committee of Mr. S. E. Willett, M.I.Prod.E., and Mr. S. R. Goodwin, M.I.Prod.E., is recorded with regret. Mr. T. Phillipson, has offered to fill one of these vacancies.

The Section are very grateful to the Directors and Management of I.C.I., Witton, Birmingham, for allowing members to visit their Metal Division on 17th June. These full day visits to works have proved to be very interesting and educational to members.

Liverpool

The Section had the privilege of entertaining Mr. J. France on several occasions during the latter half of the year, and it is hoped that he will rejoin the Section, of which he was a founder member, on the completion of his present year of office with the Birmingham Section.

A joint meeting in April with the Institution of Works Managers was very successful. Mr. E. M. Price, President of the Coventry Section, spoke on "Training As Related to Production Processes" to a large audience.

At the Annual General Meeting, Mr. J. O. Knowles was elected Section President for 1953/54, this being his second year of office. The Section were pleased to welcome, on his return from America, Mr. H. Rothwell, a member of the Methods Study Team sponsored by the Anglo-American Council on Productivity.

The Education Sub-Committee has done valuable work in encouraging the Graduates of the Section to write papers for the B. A. Williams Foundation prize, and Mr. Knowles has written to each Graduate personally on the subject.

Twenty-seven members visited Fisher & Ludlow, Ltd., on 18th June, and a visit to John Summers' steelworks was arranged for early July.

London Graduate

A successful Annual General Meeting was held on 18th March, when the Committee for 1953/54 were elected. Mr. R. T. Mustard was re-elected Chairman and Mr. L. J. Saunders, Section Hon. Secretary.

The lecture given by Mr. Hyland entitled "Estimating Department and Its Relation to Costing and Cost Control", had a very good attendance, and the lecture by Mr. Stockbridge on "The Factories Act as It Affects The Production Engineer" caused a very lively discussion which successfully rounded off the 1952/53 Session.

On March 30th a most successful works visit was made to Powers-Samas Accounting Machines Ltd.

Luton

This quarter marks the end of a successful year, in which Section activities have been well supported.

Work in connection with the investigations into Production Control, as requested by the Sub-Committee set up by the Joint Committee on Measurement of Productivity, is going ahead. A list of local firms has been compiled and promises of their co-operation obtained.

Manchester

In April a most successful series of lectures, ranging from "Measurement of Productivity" to "The Construction of the de Havilland Comet", was terminated by a paper on "The Machine Tool Industry". The Manchester Section were unanimous in congratulating their Syllabus Sub-Committee, under the Chairmanship of Mr. H. G. Gregory, for having arranged so many interesting and original papers, two of which have been published in the Journal.

During the Session, the Section enjoyed a day's visit to the Thornton Research Centre, by kind permission of Shell-Mex, Ltd.

Mr. R. H. S. Turner, the retiring Section President, will continue to serve on the Committee as Vice-President. Mr. H. Spencer Smith has been elected President for the ensuing year.

Manchester Graduate

The April lecture, "Automatic Looms and Their Application" by F. C. Sheldon, terminated the lecture programme for the 1952/53 Session.

The annual day visit was held on Saturday, 29th July. The morning was devoted to a tour of the English Electric Co. Ltd., Preston, and the afternoon to the maintenance section of Speke Airport, Liverpool.

Melbourne

On 18th April, a lecture was given by Mr. R. Deutsher, A.M.I.Prod.E., on his production impressions overseas, and in May, a lecture on "Marine Engine Production" was given by Mr. A. V. Robinson, of the Commonwealth Marine Engine Works, Port Melbourne. Following this lecture, a works visit was made to the Commonwealth Marine Engine Works.

The June meeting was held at the Melbourne Technical College, when Mr. K. H. Spencer, B.Sc., Manager of Investment Castings Pty. Ltd., Victoria, spoke on "Precision Investment Castings".

North Eastern

On 16th April, members of the Section visited the works of Vickers-Armstrong, Ltd., Tractor Division, Newcastle-on-Tyne. This proved to be one of the finest works visits made in the district.

Members of the Section Committee have represented the Institution at inaugural meetings of the British Productivity Council held in Middlesbrough, Sunderland, and Newcastle.

Northern Ireland

The Annual General Meeting of the Section was held in the Royal Avenue Hotel on 18th March. Immediately following, members present were led by Mr. H. F. Spinks in a most enjoyable discussion on methods employed in the production of hollow steel golf club shafts.

Members present expressed the opinion that more informal meetings should be held, and the Hon. Secretary was instructed to examine this suggestion with a view to incorporating this type of meeting in the 1953/54 programme.

Nottingham

During the coming session, as much publicity as possible will be given to the activities of the Section. At present, two social events are being planned: a Ladies' Outing in August to the Derwent Valley Water Scheme, and a Dinner Dance in November. The usual programme of works visits and lecture meetings is now nearing completion.

Applications for membership continue to be received, and the Section are pleased to welcome Mr. Gardiner, Deputy Controller of the North Midland Region of the Ministry of Supply.

Mr. C. H. Hodgkins has been elected to the Section Committee.

Local industry is being asked to encourage apprentices to take the Higher National Certificate in Production Engineering, a course which has recently been introduced at the Nottingham and District Technical College.

Oxford

The Oxford Section has been raised to full Section status less than a year after its inauguration. In a congratulatory letter to the members of the Committee, the Chairman, Mr. L. P. Coombes, set the doubling of the Section strength as an immediate target.

It is hoped that the close co-operation with the Reading Section and Committee will be maintained in the future.

Peterborough Sub-Section

A most successful opening year was concluded with the Sub-Section's first works visit to the factory of The British Thomson-Houston Co. Ltd., at Rugby, on 9th May.

Membership has now increased to more than double the original numbers in less than a year, and many more applications for membership are still being considered.

Arrangements for the 1953/54 programme, comprising seven lecture meetings and one works visit, are now nearing completion, and the excellent attendances experienced during the first year are expected to continue.

Preston

Mr. A. J. Charnock, O.B.E., a Past President of the Section, has taken up an appointment at the Canadian factory of Leyland Motors, Ltd. He has been a prominent member in furthering the work of the Institution, and all members of the Section wish him well.

Mr. A. F. Williamson, M.I.Prod.E., has been elected Mayor of Lytham St. Annes for the ensuing year, and the Committee have tendered to him best wishes for a successful term of office.

Reading

The retiring Chairman, Mr. F. V. Waller, who formed and inaugurated the Section as a Sub-Section in 1950, and also took a prominent part in the formation of the Oxford Sub-Section, has completed his term of office. His valued services will still be available, as he will continue to serve on the Committee.

The lecture programme for 1953/54 has been completed. The usual number of lectures has been reduced by two, films and discussion being substituted.

Sheffield

With the assistance of Mr. Edwards-Smith of Doncaster Technical College, an effort is being made to form a Sub-Section in the Doncaster area. A lecture meeting is to be held early in the coming Session, and it is hoped that many potential members will attend.

The programme arrangements for 1953/54 are complete, and include two lectures of regional status and a joint meeting with the Institute of Welding. The Annual Dinner will take place on 12th October, 1953.

It is with regret that the Committee have accepted the resignation of Mr. J. W. Walker after 22 years' service, including two periods as Section President.

Shrewsbury

The remaining lectures of this Session have continued to be well supported, whilst Committee work dealing with the 1953/54 Session has resulted in the preparation of a further programme of a high standard.

The Provisional Regional Committee met in Shrewsbury early in June. The meeting was followed by luncheon, to which the ladies were invited.

South Africa

A paper was given on 10th April by Mr. J. A. Longmuss, entitled "Machine Shop Practice". At the meeting on 7th May, Mr. H. R. Ledson gave a paper on "Modern Technique of Lubrication", after which a film entitled "The Last Ten Feet" was shown. On 4th June, Mr. P. Wertheimer gave a paper on "Screens and Screening". A Works Visit to the Klip Power Station was held on 17th June.

At the Annual General Meeting and Dinner, the South African Sub-Council Students Award will be made to Mr. B. J. Blum, and the second prize, which has been kindly donated by Mr. W. G. Gillespie, Vice-President of the South African Branch, will be awarded to Mr. W. J. Bohme.

South Essex Sub-Section

The Annual General Meeting took place in March, 1953, at Ilford. Two new Committee members, Messrs. Wright and Hammett, were elected.

Attendance at meetings remains at the same level as last year, the proportion of visitors and members being also about the same.

Mr. R. S. Soul represents this Section on the Papers Committee.

S. Wales & Monmouthshire

A visit to the National Oil Refineries at Llandarcy in April proved of considerable interest to those who attended.

A well-attended social event was organised by Mr. S. T. O. Davies for members and their ladies. This consisted of a visit to the New Theatre, Cardiff, followed by supper at the Park Hotel.

The Annual General Meeting was held in April, and this was followed by a film show provided by Mr. Abrahams. Attendance was extremely good and showed the growing interest of members in the Section activities.

Stoke-on-Trent Sub-Section

During this quarter the Sub-Section have again been very fortunate in obtaining first-class speakers and subjects.

Monthly Committee meetings have been exceptionally well attended and last year's Committee members were re-elected for this year.

Sydney

In April, a film evening was held when two technicolour films produced by the Fellows Gear Shaper Company were shown, through the courtesy of Gilbert Lodge & Co. Ltd. On 14th April, several members of the Section held a Golf Day at Pennant Hills Golf Club. At the meeting in May, Mr. R. Randerson presented a paper entitled "The Effect of Financial Controls on Australia's Productivity". On 20th May, approximately 30 members of the Section made a tour of inspection of the Captain Cook Dockyard.

At a meeting on 19th March, jointly arranged by this Section and the Australian Institute of Management, an excellent address was given by Mr. Walter C. Puckey.
(See page 411.)

Western Graduate

In the lecturette competition held in April, Mr. C. J. Bowden was awarded first prize for a paper entitled "An Introduction to Arc Welding", and Mr. G. Butler won second prize for his paper "Die Casting". The prizes were presented by Mr. E. F. Gilberthorpe, who headed the panel of judges formed from the Senior Section Committee.

At the Annual General Meeting held in March, Mr. B. R. Cutler, Student, was elected to succeed Mr. R. W. Wall, as Section Chairman.

On Saturday, 13th June, the Section's first Garden Party was held at Tickenham, Somerset, and Mr. and Mrs. W. F. S. Woodford were among the principal guests. The President of the Senior Section, Mr. G. W. Wright, officially opened the party.

Wolverhampton

A Committee meeting has been held each month, with a good attendance of members. The work of the Lecture Sub-Committee is almost complete for next Session, and a very interesting programme of lectures has been arranged. The first meeting will be held on 7th October.

On Saturday, 6th June, the fourth Regional Committee meeting was held at Shrewsbury, and some very useful discussions took place.

It is regretted that Mr. Holberry has been compelled for business reasons to resign from the Committee, as during his long period of office he has given much valuable service to the Institution.

Wolverhampton Graduate

On Saturday, 11th April, members and visitors attended a very interesting works visit to Cammell Lairds, Ltd., at Birkenhead. Also in April, Mr. J. Hill, A.M.I.Prod.E., A.I.M., M.I.B.F., gave a lecture on "The Mechanised Production of Light and Medium Weight Moulds". On 6th May, a number of Students and Graduates visited the works of Vauxhall Motors, Ltd., Luton.

A Brains Trust meeting on Production Engineering Problems was held in May. The June lecture, entitled "British Watch and Clock Production" was given by Mr. R. Lenoir, F.B.H.I.

HUMAN ASPECTS OF MANAGEMENT

The North-Western Polytechnic announces that a series of part-time courses on Human Aspects of Management will begin in September, 1953. Each course will deal in a practical way with the human problems met by those who are responsible for the activities of groups of people in any kind of organisation, industrial, commercial or administrative.

Discussions will cover the factors affecting the capacity of the worker and the factors affecting the will to work, including such topics as fatigue and monotony, morale and discipline, incentives, joint consultation, and practice will be given in the techniques of selection, interviewing and running meetings, both formal and informal.

Each course consists of 24 weekly all-day meetings, and courses begin on 29th September and 5th January next. The fee for each course is £4.

Further details may be obtained on application to the Head of the Department of Commerce and Professional Studies, North-Western Polytechnic, Prince of Wales Road, London, N.W.5.

POST GRADUATE COURSE IN PRODUCTION ENGINEERING

The Department of Mechanical Engineering, King's College, Newcastle-upon-Tyne, announces that the next course leading to a College Certificate in Production Engineering will commence in October, 1953. The Course is a whole-time one extending from October to June, and is open to graduates in Applied Science and to holders of a Higher National Certificate in Engineering. The subjects studied include Engineering Production Processes, Engineering Administration, Jig and Tool Design, Metallurgy and Statistics.

Further particulars may be obtained from the Registrar, King's College, Newcastle-upon-Tyne.

STANDING COMMITTEES 1953/54

Finance and General Purposes Committee

The Principal Officers:-

The President, W. C. Puckey, F.I.I.A.
The Chairman of Council, H. Burke
The Vice-Chairman of Council, G. R. Pryor

Major-General K. C. Appleyard, C.B.E., T.D., D.L., J.P.
L. Bunn — E. P. Edwards — H. G. Gregory
J. E. Hill — B. G. L. Jackman

The Chairmen of all Standing Committees: Editorial, Education, Hazleton Memorial Library, Membership, Papers, Research and Standards Committees.

Editorial Committee

Principal Officers: J. M. Brice — L. Bunn
A. A. J. Francis — K. J. Hume — H. P. Jost
M. Seaman

Each Standing Committee will be asked to nominate one representative to serve on this Committee.

Education Committee

Principal Officers — A. J. Aiers — F. W. Cooper
F. W. Cranmer — E. P. Edwards — H. L. Haslegrave
B. G. L. Jackman — Prof. T. U. Matthew — C. L. Old
L. S. Pitteway — R. Ratcliffe — B. E. Stokes
F. Woodifield — T. B. Worth

Hazleton Memorial Library Committee

Principal Officers — H. A. Chambers — G. Cubitt-Smith
R. Hutcheson — H. L. Madeley — J. C. Z. Martin
R. V. Rider — The Right Hon. Lord Sempill
L. J. Saunders — H. G. Shakeshaft — S. R. Smith
R. Thorn — G. C. Twine

Each Section Committee will be asked to nominate a member to assist the Library Committee in reviewing and abstracting books, etc. This work will, of course, be done by correspondence and will not involve attendance at meetings.

Membership Committee

Principal Officers — A. G. Clark — L. E. Broome
F. W. Cranmer — R. P. Eccles — E. P. Edwards
W. N. Ellerby — W. H. Folds — J. A. Francis
J. F. Gibbons — B. W. Gould — R. L. Paice
S. A. J. Parsons — E. W. Pickston — H. Tomlinson
F. Woodifield

Papers Committee

Principal Officers — W. Armstrong — L. Bunn
W. J. T. Dimmock — A. A. J. Francis — K. J. Hume
H. P. Jost

Each Section Committee will be asked to nominate one representative to serve on this Committee. Section representatives who cannot regularly attend meetings of the Committee may be "corresponding" members and can assist in the work of the Committee by the assessment of Papers and in other similiar ways.

Research Committee

Principal Officers — J. H. Bingham — A. J. Bullivant
L. P. Coombes — F. T. Dean — B. H. Dyson
T. W. Elkington — F. G. S. English — R. M. Evans
Dr. D. F. Galloway — A. G. Hayek — P. Holmes
R. N. Line — Prof. T. U. Matthew — S. G. E. Nash
S. W. Nixon — M. Seaman — P. Spear
W. J. Webb

Standards Committee

Principal Officers — R. K. Allan — J. E. Baty
E. G. Brisch — L. P. Coombes — C. M. Holloway
K. J. Hume — H. Lister — H. L. Madeley
R. E. Mills — H. Stafford — J. L. Widdowson
W. E. Wright

NEW BUILDING FUND APPEAL

The first list of subscribers to the New Building Fund Appeal, which was launched in July, is published below. (This list was compiled for press on 10th August, 1953.)

D. W. Abbot, Stud.I.Prod.E.
A. B. Metal Products Ltd.
Cyril Adams & Co. Ltd.
H. L. Adams, A.M.I.Prod.E.
J. B. Aldred, M.I.Prod.E.
Major Gen. K. C. Appleyard, C.B.E., M.I.Prod.E.
G. P. Archibald, A.M.I.Prod.E.
W. Armstrong, M.B.E., M.I.Prod.E.
W. & T. Avery, Limited.

J. H. Bailey, A.M.I.Prod.E.
S. Baker, Grad.I.Prod.E.
F. T. Baldwin, A.M.I.Prod.E.
R. Ball, Grad.I.Prod.E.
G. H. Barker, A.M.I.Prod.E.
G. T. G. Bayliss, Grad.I.Prod.E.
F Beach, A.M.I.Prod.E.
R. Beasley, M.I.Prod.E.
J M. Beattie, A.M.I.Prod.E.
E Bedwell, A.M.I.Prod.E.
W. M. R. Bell, Grad.I.Prod.E.
J. L. Bennet, M.I.Prod.E.
R. W. H. Bennett, Grad.I.Prod.E.
Benton & Stone Ltd.
J. R. Bergne-Coupland, M.I.Prod.E.
E. Bernfeld, M.I.Prod.E.
D. W. Birchmore, Grad.I.Prod.E.
Birlec Ltd.
Black & Decker Ltd.
K. C. Blackmore, A.M.I.Prod.E.
J. E. Blackshaw, M.B.E., M.I.Prod.E.
A. H. Blackwell, M.I.Prod.E.
J Blakiston, M.I.Prod.E.
Dr. J. W. Bondi, M.I.Prod.E.
J. E. Boughton, Grad.I.Prod.E
P. Boyd, Stud.I.Prod.E.
T. Bradbury, A.M.I.Prod.E.
E. Brammer, Stud.I.Prod.E.
S. H. Brewell, M.B.E., M.I.Prod.E.
British Tabulating Machine Co. Ltd.
J. Brook, A.M.I.Prod.E.
S. E. Brookes, A.M.I.Prod.E.
Brooke Tool Manufacturing Co. Ltd.
J. G. Brown, A.M.I.Prod.E.
R. S. Brown, M.I.Prod.E.
R. W. Brown, A.M.I.Prod.E.
L. E. Bull, A.M.I.Prod.E.
W. D. Bullows, M.I.Prod.E.
J. R. Bunney, M.I.Prod.E.
D. Burgess, M.I.Prod.E.
A. G. Burton, A.M.I.Prod.E.
Butler Machine Tool Co. Ltd.

J Carpenter, Stud.I.Prod.E.
L. Carter, M.I.Prod.E.
C. F. Casella & Co. Ltd.
Catmur Machine Tool Corpn. Ltd.
H. D. Chapman, Stud.I.Prod.E.
R. Chapman, Grad.I.Prod.E.
Churchill Machine Tool Co. Ltd.
G. Clancey, A.M.I.Prod.E.
A. E. Clauson, Grad.I.Prod.E.
S. R. Clayton, Stud.I.Prod.E.
Climax Rock Drill & Engineering Works Ltd.
W. H. Cockerill, A.M.I.Prod.E.
J. E. Cook, A.M.I.Prod.E.
C. A. Cordwell, A.M.I.Prod.E.
W. J. Costin, Grad.I.Prod.E.
Coventry Gauge & Tool Co. Ltd.
Coventry Victor Motor Co. Ltd.
H. Cowlishaw, M.I.Prod.E.
T. R. Creffield, A.M.I.Prod.E.
H. Crowther, A.M.I.Prod.E.
C. H. Cunniffe, M.B.E., M.I.Prod.E.
C. V. A. Jigs, Moulds & Tools Ltd.

Capt. H. Leighton Davies, M.I.Prod.E.
Col. J. A. Davies, M.I.Prod.E.
Davy & United Engineering Co. Ltd.
J. Dawson, Stud.I.Prod.E.
F. T. Dean, M.I.Prod.E.
Dean, Smith & Grace Ltd.
J. I. Dennison, Grad.I.Prod.E.
T. S. Dickinson, A.M.I.Prod.E.
A. A. S. Dickson, A.M.I.Prod.E.
J. G. Douglas, M.I.Prod.E.
G. H. Dove, M.I.Prod.E.
W. R. Dowle, Grad.I.Prod.E.
C. W. J. Downs, A.M.I.Prod.E
Dowty Equipment, Ltd.
W. G. V. Duffin, A.M.I.Prod.E.
F. A. Duncan, Grad.I.Prod.E.
B. G. Dyer, A.M.I.Prod.E.
B. H. Dyson, M.I.Prod.E.

C. A. Edwards, Grad.I.Prod.E.
T. Edwards, Grad.I.Prod.E.
A. E. Eggington, M.I.Prod.E.
P. K. Eisner, A.M.I.Prod.E.
R. J. Ellis, Stud.I.Prod.E.
M. Emmanuel, Stud.I.Prod.E.
K. O. Engel, M.I.Prod.E.
C. Evans, A.M.I.Prod.E.

J. Farmery, A.M.I.Prod.E.
E. N. Farrar, M.I.Prod.E.
E. Fedder, A.M.I.Prod.E.
G. A. Felton, Grad.I.Prod.E.
P. C. Felton, Grad.I.Prod.E.
L. C. Fensom, A.M.I.Prod.E.
Ferranti, Ltd.
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T. Fraser, C.B.E., Hon.M.I.Prod.E.
E. Freestone, A.M.I.Prod.E.

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B. G. Green, Grad.I.Prod.E.
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H. Killingback, Grad.I.Prod.E.
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R. J. Lambourne, Grad.I.Prod.E.
G. H. Lanchester, M.I.Prod.E.
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R. R. Leake, A.M.I.Prod.E.
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Sir Cecil Weir, K.C.M.G., K.B.E., M.C., M.I.Prod.E.
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Thomas White & Sons Ltd.
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F. Whitehead, M.I.Prod.E.
A. Whittaker, Stud.I.Prod.E.
Wickman, Ltd.
C. A. Wigmore, A.M.I.Prod.E.
Wild-Barfield Electric Furnaces Ltd.
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B. A. Williams, O.B.E., M.I.Prod.E.
C. H.T. Williams, M.I.Prod.E.
N. E. Williams, Grad.I.Prod.E.
M. Withers, Grad.I.Prod.E.
G. Wittenburg, Grad.I.Prod.E.
Wolf Electric Tools Ltd.
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F. G. Woollard, M.B.E., M.I.Prod.E.
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H. Yates, A.M.I.Prod.E.
D. H. Youngman, Grad.I.Prod.E.

INSTITUTION NOTES

THE 1953 SIR ALFRED HERBERT PAPER

On Friday, 24th July, in the Sheldonian Theatre, Oxford, the 1953 Sir Alfred Herbert Paper was presented to the Institution by Sir John Cockcroft, K.C.B., C.B.E., M.I.E.E., F.R.S., Director of the Atomic Energy Research Establishment, Harwell, who took as his subject " Industrial Applications of Radio-active Materials ".

Over 600 members and guests were present at the lecture, which was followed by a two-hour discussion opened by Professor F. E. Simon, of the Clarendon Laboratory. A full report of the Meeting, together with written contributions, will appear in the October issue of the Journal.

Immediately preceding the lecture, the President of the Institution, Mr. Walter Puckey, gave a tea party in the grounds of Trinity College, to enable Members of Council to meet Sir John Cockcroft, University authorities, and leading local industrialists. (Photographs appear on page 412.)

BOMBAY SECTION ANNUAL DINNER

The first Annual Dinner of the Bombay Section was held at the Taj Mahal Hotel, Bombay, on 31st March, 1953, and was attended by about 100 members and guests.

The Guest of Honour was Dr. Jivraj N. Mehta, the Minister for Finance, Industry and Prohibition, Government of Bombay. Other guests and members represented a cross section of the commercial, educational and industrial life of Bombay and included Mr. J. D. Chowksy, Director of Tata Industries, Ltd.; Mr. Bell, Principal, International Correspondence Schools, Bombay; Mr. Sen Gupta, Head of the Department of Engineering, Victoria Jubilee Technical Institute; Mr. Karnik, Editor, Engineering Section, " Times of India "; and many other prominent personalities.

The Section President, Mr. R. A. P. Misra, in his address welcoming the principal guest, said that the Bombay Section were fortunate in having Dr. Mehta

This photograph taken during the first Annual Dinner of the Bombay Section shows the principal Guest of Honour, Dr. Jivraj N. Mehta, Minister for Finance, Industry and Prohibition, Government of Bombay, replying to the President's address of welcome. Listening to him are (back row, from left): a lady guest; the General Manager of Alcock & Ashdown, Ltd.; Mr. J. V. Patel, Vice-President-Elect and Managing Director of New Standard Engineering Co. Ltd.; Mrs. R. A. P. Misra; Mr. R. A. P. Misra, Section President, and Managing Director of Indian Wild Barfield Co. Ltd.; Mr. J. D. Chowksy, Director of Tata Industries, Ltd.; Mrs. E. H. Y. Burden; Mr. S. G. Barbet, member of Bombay Section Committee. Facing Dr. Mehta are (from left): Mr. Bell, International Correspondence Schools, Bombay; Mrs. M. W. Hall; Mr. Mullah, General Manager, Investa Machine Tool Co. Ltd.

present, as he had just been through a very busy Budget session. Mr. Misra said that when he returned to a free India after living for more than a decade in England, he saw his own country from the objective viewpoint of an outsider. There were many things in India which showed improvement and promised greater progress in the near future. One of the most satisfying things about working in India was the thrilling sight of an ancient oriental nation trying to lift itself by its own bootstraps, whilst retaining the democratic structure.

An achievement which reflected the greatest credit on the Government and people of India had been the successful conclusion of the largest democratic elections carried out anywhere in the world. Mr. Misra had noted that perhaps there was some room for improvement in the co-operation between the Government and the business and industrial community.

The President went on to say that he had observed, on occasions where representatives of the Government had met professional or business men by invitation, the latter had usually presented a catalogue of their grievances and asked the Government to do " this, that and the other ". Tonight he was going to address his remarks primarily to his own colleagues and give the Minister a few bouquets, as he was well used to receiving brickbats.

Increased Taxation

There had been much criticism of increased taxation on motor vehicles in the State. Mr. Misra had, however, seen that a great deal of money was being spent on road repairs and construction. If taxes were used for national building activities, they ought to be paid, with some pride in making a contribution to the country's resources. To the Finance Minister, Dr. Mehta, he would only request that he should keep the operation of tax collection as painless as possible! Indirect taxes were like sugar-coated pills as compared with the bitter pills of direct taxes, a distinction which the Minister, as a medical man, would readily appreciate. Apart from this, the President assured the Government that all men of good will, were they engineers, businessmen, or industrialists, were anxious to co-operate with the Government in every way to build the New India of their dreams.

The Honourable Minister, Dr. Mehta, in his reply, said that he very much appreciated the cordial

(continued on page 413)

PRESIDENT'S VISIT TO AUSTRALIA

During Mr. Walter Puckey's recent visit to Australia on Government business, he naturally made it his concern to meet as many members of the Institution as possible. He was able to meet and address representative gatherings of members in Melbourne, Sydney and Adelaide. He was also able to address a very large meeting in Sydney, which was organised by Mr. E. T. Pysden, Registrar of the Sydney Division of the Australian Institute of Management. Those attending included members of the Institution and of the A.I.M. and other interested bodies.

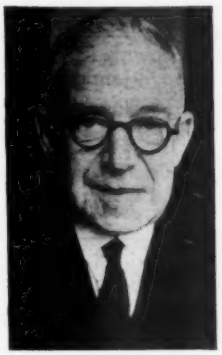
The photograph above was taken immediately prior to the commencement of this meeting, and those included in the group are (l. to r.) Mr. C. E. Jones; Mr. E. C. A. Parkinson; Mr. J. Strick (President of the Sydney Section; Mr. Puckey; Mr. N. J. Smith (President, Sydney Division, A.I.M.; Mr. S. Downie; and Mr. S. Barratt.

In the grounds of Trinity College, Oxford, are (left to right) Lord Sempill, Member of Council; Sir John Cockcroft; Professor F. E. Simon, of the Clarendon Laboratory; Lord Cherwell Paymaster General; and Mr. G. R. Pryor, Vice-Chairman of Council. The photograph below gives a general view of the tea party. On the left, foreground, is Lord Cherwell with the President, Mr. Walter Puckey (back to camera) and Mr. W. F. S. Woodford, Secretary of the Institution. *Photographs by courtesy of the "Oxford Mail" and "Machinist".*

NEWS OF MEMBERS

MR. JOHN W. WALKER.

The Sheffield Section Committee have received with regret the resignation from the Committee of one of their leading Members Mr. J. W. Walker.



Mr. J. W. Walker

Mr. Walker, who has been connected with the Section since its inauguration, joined the Committee in 1936. He became Section President in 1939, remaining in office until 1942.

He has always been one of the most active members of the Section, and his long experience on the Committee has been of the greatest value to fellow members.

Mr. Walker is Works Director at Sanderson Bros. & Newbould Ltd., Sheffield.

Bombay Section Dinner (*concluded from page* 411)

remarks of the President. However, he did not oppose brickbats of criticism, as they often led to improvements. Due to the provisions of the Indian constitution, the avenues of taxation open to the State Governments were considerably narrowed, and it was not therefore practicable to adopt all the suggestions made by the President in respect of indirect taxation. He was, however, very glad to know that such an active organisation as the Institution of Production Engineers, devoted to improving the science and technique of production, was functioning in Bombay, by means of which both Indians and Europeans could co-operate in exchanging technical knowledge and "know-how". Improvement in production techniques was one of the greatest needs of the country, and he hoped that the Institution would continue to prosper and make a contribution towards solving the country's problems.

Dr. Mehta thanked the President for inviting him to an excellent Dinner, as it gave him an opportunity of finding out what some of the industrialists and businessmen in Bombay were thinking.

The proceedings terminated following an expression of appreciation by the President to all those connected with the organisation of the Dinner, with particular reference to the Acting Secretary, Mr. M. W. Hall.

MR. A. J. CHARNOCK, O.B.E.

Mr. A. J. Charnock, O.B.E., Member, until recently General Works Manager, of Leyland Motors Ltd., Lancs., has been appointed General Manager of their Canadian Headquarters at Longueuil, near Montreal. As President of the Preston Section from 1950/52, Mr. Charnock made an invaluable contribution to the Section's progress, and its members wish him all happiness and success in his new sphere.

Mr. A. J. Charnock

DEATH OF MR. J. D. MOOKHERJEE

Members will learn with deep regret of the death of the President of the Calcutta Section, Mr. J. D. Mookherjee, as a result of a car accident on the 18th July last.

Mr. Mookherjee's activities in the Calcutta Section have been of the greatest value in establishing and strengthening the Institution in India, and he will be sadly missed by all his friends and colleagues.

NEW APPOINTMENTS

Mr. W. J. Anderson, Member, has taken up an appointment as General Manager of the Glacier Metal Company's No. 3. Factory at Kilmarnock, Ayrshire.

Mr. C. T. Butler, Associate Member, has been appointed Head of the Department of Mechanical Engineering at the Nottingham & District Technical College, and will commence his new duties on the 1st January, 1954.

Mr. H. J. Cheston, Associate Member, has been transferred to the Scottish Region of British Railways and is now a Production Engineer with the M. & E. E. Department, Glasgow.

Mr. E. B. Loewendhal, Associate Member, is now Planning and Production Engineer with The Central Tool & Equipment Co. Ltd., Hemel Hempstead, Herts.

Mr. R. K. Longmire, Associate Member, is now General Manager of the Merchant Box Co. (Grimsby) Ltd., Grimsby.

Lt. Col. P. Mackay-James, Associate Member, is now Director and General Manager of Blackstone & Co. Ltd., Stamford.

Mr. S. M. Patil, Associate Member, has joined Hindustan Machine Tools, Ltd., Bangalore, India, as Works Manager.

Mr. O. E. Trivett, Associate Member, has been appointed to the Board of Directors of Aerialite Ltd.

Mr. William V. Walbank, Associate Member, has taken up an appointment as Works Superintendent with Weatherly Oilgear Ltd., Biggleswade.

Mr. G. J. Aries, Graduate, is now a Process Planning Engineer with J. and H. McLaren, Ltd., Staines, Middlesex.

Mr. J. P. Dainty, Graduate, is now a Production Development Engineer with Vickers-Armstrongs Ltd., Aircraft Division, Weybridge.

Mr. D. J. I. Gray, Graduate, who has recently emigrated to New Zealand, has been appointed Works Manager of the South Otago Engineering Co. Ltd., of Balclutha. Mr. Gray was previously Assistant Quality & Standards Engineer with John Fowler & Co. (Leeds) Ltd., and Marshall & Sons, Gainsborough.

Mr. J. G. Harlow, Graduate, has been appointed Technical Assistant with the Frigidaire & Industrial Division of General Motors (South Africa) Ltd., Port Elizabeth.

Mr. G. Harrison, Graduate, has been appointed Manager of Abercom Engineering Cape (Pty) Ltd., Cape Town.

Mr. D. Jamie, Graduate, is now Assistant Technical Engineer with Coated Steel of Europe Ltd., St. Helier, Jersey.

Mr. F. E. Letchford, Graduate, is now a Senior Jig & Tool Designer at the Monotype Corporation, Redhill, Surrey.

HAZLETON MEMORIAL LIBRARY

Members are asked to note that the Library will normally be open between 10 a.m. and 5.30 p.m. from Monday to Friday each week. The full facilities will not be available at the following times during this month :—

Tuesday,	1st September	from 2 p.m.
Thursday,	10th September	all day.
Tuesday,	29th September	from 2 p.m.

It would be helpful if, in addition to the title, the author's name and the classification number could be quoted when ordering books.

AUTOMATIC TRANSFER MACHINES:
A Select Bibliography

(This Bibliography is the first of a series, on selected subjects, which will be published from time to time.)

Grateful acknowledgment is made to Mr. F. G. Woollard, M.B.E., M.I.Mech.E., M.I.Prod.E., M.S.A.E., for assistance in the compilation of this Bibliography.

Numbers after the titles of journals refer to the volume, pages and date of issue. All the items mentioned may be borrowed from the Hazleton Memorial Library.

AMERICAN MACHINIST 96 : 154-155, Aug. 4, 1952. Drum switch sets Snyder transfer machine.

AUTOMOBILE ENGINEER 40 : 178-186, May 1950. Cylinder head production: a review of recent developments employed by Vauxhall Motors Ltd.

AUTOMOBILE ENGINEER 41 : 255-264, July 1951. Transfer machining: the production of cylinder blocks for Consul and Zephyr engines.

AUTOMOBILE ENGINEER 41 : 303-304, Aug. 1951; MACHINERY 78 : 1009-1011, June 14, 1951; MACHINE TOOL REVIEW 39 : 87-90, July-Aug. 1951. Centreless grinding: an interesting Scrivener development for transfer machining.

AUTOMOBILE ENGINEER 41 : 373-378, Oct. 1951. Cylinder head machining: production methods for Ford Zephyr and Consul engines.

AUTOMOBILE ENGINEER 43 : 113-124, March; 163-174, April 1953. Small car production: the manufacture of engines and transmissions for the Austin A30.

ENGINEER 193 : 529-531, April 18, 1952. A transfer machine for gear boxes: (Morris Motors Ltd.).

ENGINEERS' DIGEST 13 : 301-306, Sept. 1952. Special purpose machine tools and the unit construction principle. *J. C. Z. Martin.*

ENGINEERS' DIGEST 14 : 83-85, 90, March 1953. Recent developments in the Soviet machine tool industry. *J. Mannin.*

INSTITUTION OF PRODUCTION ENGINEERS JOURNAL 32 : 18-36, Jan. 1953. The advent of automatic transfer machines and mechanisms. *F. G. Woollard.*

IRON AGE 168 : 90-91, Nov. 22, 1951. Planning pays off in transfer machine operation: (Cross Transfermatic machine for Warner Gear Div., Borg-Warner Corp.).

IRON AGE 169 : 117-125, May 22, 1952. Automatic forging presses feature new shell line: (Verson Allsteel Press Co.). *J. A. Verson* and *H. Irwin.*

IRON AGE 170 : 156-157, Sept. 11, 1952. Transfer equipment stresses flexibility, cuts cost: (Willys-Overland Motors Inc., Toledo, Ohio). *J. E. Snowberger.*

IRON AGE 170 : 108-110, Oct. 2, 1952. Transfer machines handle 4-ton armour plate weldment: (Massey-Harris Co., Racine, Wis.). *J. S. Kis, Jr.,* and *R. M. Olsen.*

IRON AGE 170 : 142-144, Dec. 18, 1952. Chip engineering vital counterpart to automated machining lines.

IRON AGE 171 : 129-132, Feb. 12, 1953. Transfer-type machine tools can be standardized: (Cross Co., Detroit). *W. G. Patton.*

MACHINE SHOP MAGAZINE 10 : 91-98, Sept. 1949. Mechanical handling built into machine tools; automatic transfer machines reduce production costs. (Cross Co., Detroit.)

MACHINE TOOL REVIEW 40 : 108-112, Sept.-Oct. 1952. Archdale machines on Diesel engine production: (L. Gardner & Sons Ltd.).
Abridged in **MACHINERY 81 : 1237-1239, Dec. 12, 1952.**

MACHINERY 77 : 163-170, Aug. 10, 1950. Renault production methods: extensive utilization of unit heads for transfer and other automatic machines at a French factory.

MACHINERY 77 : 547-554, Nov. 30, 1950. Production of commercial vehicle engines on transfer-type machines: (Reo Motors Inc., Michigan). *A. W. Zimmer.*

MACHINERY 78 : 70-71, Jan. 11, 1951. Cross Toolometer control unit for automatic transfer machines.

MACHINERY 78 : 909-910, May 31, 1951. Baush transfer machine for an automatic transmission component.

MACHINERY 79 : 188-191, Aug. 2, 1951. Longitudinal operations performed on an automatic transfer machine: (General Electric Co., Erie, U.S.A.).

MACHINERY 80 : 46-58, Jan. 10, 1952. Machining Morris-Oxford gearboxes on an Archdale transfer machine.

MACHINIST 93 : 419-420, July 16, 1949. Transfer machine produces cycle spokes: (D. Smith Ltd., Wolverhampton).

MACHINIST 94 : 688-689, May 6, 1950. Selection of transfer machines for medium-volume production: (Cadillac Motor Car Div., General Motors). *R. LeGrand.*

MACHINIST 95 : 88-89, Jan. 20, 1951. New Buick crankcase line shows many improvements. *S. White.*

MACHINIST 95 : 299-304, Mar. 3, 1951. How they handle on the Vauxhall machine lines.

MACHINIST 95 : 873-882, June 16; 913-922, June 23, 1951. Transfer machines do the work on Ford's new block line.

MACHINIST 95 : 1497-1502, Oct. 6, 1951. They have also been working on transfer machines in Russia. *L. A. Ferney.*

MACHINIST 95 : 1891-1896, Dec. 15, 1951. Austin build their own suspension link transfer machine to increase productivity.

MACHINIST 96 : 109-116, Jan. 26, 1952. Easy changeover is a feature of Ford's cylinder head line.

MACHINIST 96 : 537-544, April 12, 1952. Layout study for an automatic piston factory . . . report by post-graduate students at Harvard Business School.

MACHINIST 96 : 611-618, April 26, 1952. Austin re-equip with standard unit heads. *W. A. Hawkins.*

MACHINIST 96 : 663-678, May 3, 1952; AMERICAN MACHINIST 96 : 135-150, Mar. 17, 1952. How Ford automates production lines. *R. LeGrand.*

MACHINIST 96 : 1062-1064, July 12, 1952. Chain conveyor circulates transfer machine fixtures: (Vauxhall Motors, Luton). *W. A. Hawkins.*

MACHINIST 97 : 133-142, Jan. 24, 1953; AMERICAN MACHINIST 96 : 109-118, Dec. 8, 1952. Latest improvements in press automation at Ford. *M. J. Rowan.*

MACHINIST 97 : 285-289, Feb. 21, 1953. Transfer machines have their transport problems. *H. Goebel.*

MASS PRODUCTION 28 : 62-73, Sept. 1952. Transfer machines.

MECHANICAL HANDLING 39 : 150-154, April; 207-215, May; 277-283, June; 363-369, July; 398-403, Aug.; 478-483, Oct. 1952; 40 : 33-39, Jan.; 67-72, Feb.; 125-133, Mar. 1953. The Basic principles of mass and flow production. *F. G. Woollard.*

TOOL ENGINEER 28 : 51-68, Feb. 1952. A Text on automation: DeSoto Division. *G. P. Muir.*

WERKSTATTSTECHNIK UND MASCHINENBAU 42 : 128-134, April 1952. Selbsttätige Maschinen-Fliessreihen: (Automatic Flow-lines). *H. Goebel.*

REVIEWS

621.0052 AUTOMATIC SYSTEMS

"Automation—The Advent of the Automatic Factory" by John Diebold. *New York, Van Nostrand. London, Macmillan,* 1952. 182 *pages.* 21/-.

"Automation—The Advent of the Automatic Factory" by John Diebold, is a book which can be read with both profit and pleasure. It deals with the automatic control of factory operations from the practical aspect and from the social and philosophical viewpoints. It is a book which discusses principles rather than details and therein, perhaps, lies its greatest value.

The chapter on "Control and the Computer" is interesting inasmuch as it shows how the development of the feed-back system, which enables machines to effect corrections of their own work, will make "automation" so very much more than a superior form of mechanical handling of machines, goods or information.

The chapter on "The Re-design of Product and Process" is one of particular importance which, however, may lead to considerable controversy because of the well-known fact that the public do not want products that suit the means of production unless they also suit the desires of the consumer. This is very fairly debated on both sides. The author's impartiality bespeaks a mind that is balanced and just.

"The Automatic Handling of Information" is a chapter which reveals the possibilities of the future in reducing the burden of a growing overhead which in modern business is becoming an incubus which is quite frightening. Your reviewer remembers the days when a N.E. Coast engineer described his accounting system as follows: "When we have t'money we put it in t'Bank. When we want t'money we take it out t'Bank and what's left is t'profit." That simplicity has gone for ever, but the use of these new methods may well bring back, in effect, that simplicity coupled with speed and exactitude and that will, indeed, be a major blessing. The author shows how this may be accomplished.

The author discusses "What will Automation Mean to Business" and "Some Social and Economic Effects on Automation". He performs a great and necessary service in debunking the journalistic view of the factory of the future and he offers some salutary remarks on the tendency of the romantics among them to anthropomorphise the machine. In dealing with the social effects of large scale automatisation, he indicates his belief that the rate of change will not be so rapid as to disturb society too violently, although he agrees that all the possibilities should be borne in mind. It is made plain that "automation" will give relief in all laborious repetitive tasks in both factory and office. In particular it is stressed that long and difficult calculations will be effected in unbelievably short times.

Lest your reviewer should be thought too easily impressed with the brilliance of this exposition, it may be remarked that there are a few "Americanisms" which seem strange to the British reader. One is the use of the word "structure" as a verb and another is an unaccustomed use of "inventory" as applied to the float of work-pieces between machines; but we can afford to be generous when we realise the amount of excellent matter spread before us by this most interesting of writers.

F.G.W.

331.753 PROFESSIONS

" Professional People " by Roy Lewis and Angus Maude. *London, Phoenix House,* 1952. 284 *pages.* 18/-.

" Professional status " is a highly prized hallmark which in recent years has become much sought after. The prestige, value and implied professional status of letters designate has led to a conglomeration of alphabetical combinations, as more and more specialists crave recognition for their own particular battle with the problems arising from the increasing complexity of life.

But what does professional status imply and how can it be conferred? Is it important? Should it be preserved? If so, how? What are the influences and trends arising from complexity and specialisation and the growth of government activity? It is surprisingly enjoyable to step back from the rough and tumble for a while and in the good company of Messrs. Maude and Lewis discuss these and many other related questions and seek answers.

In this witty, provocative and yet profound book, the authors have shown in sharp relief something of the heritage of tradition, integrity and service which has become associated with all that is best in professional status and activity.

Whatever the tendency to deplore specialisation it is clear that the history of the professions is the history of specialisation—albeit specialisation tempered by the realisation that breadth of experience, liberality of education and an understanding of fundamentals must be preserved in professional training if the specialist is to be adequate for his task. The increase in specialisation has, however, been considerably speeded up both by the increasing complexity of a society demanding an ever higher standard of life and welfare, and by the growth of centralised government activity. These trends with which the book deals in considerable detail, while increasing the demand for professional services also present a strong threat to undermine the traditional qualities of professional life of obligation and responsibility.

The authors with some force express the opinion that these qualities are founded ultimately more on direct personal relations, ties of honesty, trust and loyalty between a professional man and his client, than upon any natural or instinctive urge to serve the community. But present-day trends are replacing this personal relationship between professional man and client with the relationship of professional man to employer. In addition, the nature of much professional work has become more materialistic and preoccupied with things and theories rather than people and atmospheres. Training methods are also reflecting these changes and are tending to encourage professional people to hand over direction of their affairs to non-professional administrators because of the size and complexity of the administrative problem. The authors mention, and they could probably have made much more of the fact, that the administrative problem could be much better handled by more decentralisation.

The comments upon training costs and financial prospects of various professions will be of particular value to parents and students.

The authors conclude from their very considerable researches that professional people have inherited the leadership in Britain today and that this leadership will be in good hands if they can remain professional in the best sense. But this will require hard work to strengthen an influence that is waning and will require that:

> " Those who claim to possess something of vital importance to the Community should be prepared, not only to state clearly what it is, but also to fight to preserve it for the Community's good."

B.E.S.

621.91 MILLING

" A Treatise on Milling and Milling Machines." *3rd ed. Cincinnati Milling Machine Company, Cincinnati, Ohio,* 1951. 910 *pages. Illustrated. Diagrams.* $8.00.

The first six chapters of this book give a complete description of milling machines together with their accessories, also a description of milling cutters and full particulars of their design, selection, and materials used for their manufacture. A lengthy chapter is devoted to cutter sharpening and maintenance.

The next three chapters are concerned with the theory of milling and consider in detail the fundamental concepts of the subject, together with full information on chip formation, surface finish, cutting fluids and power required when milling.

The remainder of the book—some six hundred pages—is devoted to the practical aspects of milling and considers the use of the milling machine for both toolroom and production work. A large amount of detailed information is given on indexing, spiral milling, and cam milling. Chapters are devoted to mould drilling and other special applications. The final chapter is devoted to information on the selection of machine, cutter and fixture, also the economics of machine replacement and batch size.

This volume is probably the most comprehensive book ever published on milling. From all points of view the book is as near perfect as any machine tool publication can ever hope to be. It is definitely a treatise and not an operator's manual, but it may be read with profit by the better class operator as well as supervisors and foremen responsible for machine shop work.

Nine hundred pages of high grade paper are very heavy and the writer suggests that the publishers might consider breaking the volume down into 2 parts for the next edition.

It is hoped that one day the publishers may fill other gaps in engineering literature by producing books of a similar quality dealing with the other classes of machine tools that they manufacture. S.R.S.

658. INDUSTRIAL ORGANISATION : MANAGEMENT

" Management, Its Nature and Significance ", by E. F. L. Brech. *3rd. ed. London, Pitman,* 1953. 150 *pages.* 12s. 6d.

Large numbers of books about management " tool " subjects have been published, but relatively few have dealt with the nature and process of management itself. This third edition brings up to date Mr. Brech's original contribution of 1946 to the remedy of this situation.

The whole book, but in particular the chapters " What is this Management ? ", " The social purposes and responsibilities of Management " and " Management in action ", deal in a discursive manner with the " act of managing " ; and they clearly indicate the difference between managing by means of papers and statistics alone on the one hand and handling the very human problems of co-ordinating the personal efforts of people, on the other.

The object of the book is not to deal exhaustively with the many aspects into which this area of management study can be divided, but rather to provide a comprehensive survey that will lead students and managers to probe further into the subject with the aid of more specialised treatises.

That this is so is evidenced by the fact that "Organisation—The Framework of Management " is dealt with in eighteen pages, and " The Training of Managers " in five pages. It is to be expected, therefore, that such a treatment tends to become inadequate as more knowledge is gained about such an expanding subject. In any case, omissions cannot be avoided. For example, under " Organisation " little is said about the effects of size on administrative units, the current trends towards decentralisation, particularly in the U.S.A., and the different problems of co-ordination that arise from different forms of organisation.

It is inevitable that a work such as Mr. Brech's lays itself open to a continuing threat of obsolescence, a fact to which the three Prefaces testify.

This it not to say that this book it without value—far from it. It will give increased breadth to the student manager's concept of management, and should stimulate his use of the bibliography. The book provides a challenge to viewpoint to those practising managers who are already interested in scientific management and a spur to the too numerous managers who are not.

L.J.S.

621.7 WORKSHOP PRACTICE : PRODUCTION METHODS

"Technology of Engineering Materials", by B. Richard Hilton. *London, Butterworth's Scientific Publications,* 1953. 389 *pages. Illustrated. Diagrams.* £1. 16s. 0d.

There are two types of useful textbook : one which is mainly descriptive, and therefore makes interesting reading, and the second consisting of tables and calculations, which is really a reference book.

In the "Technology of Engineering Materials", there is a combination of both types with the descriptive part exceptionally detailed.

The work, of nearly 400 pages, is divided into four main sections. The first part deals with pattern-making which is normally entirely neglected. The subject is covered from wooden patterns to investment moulding. The average designer can obtain information here, which, when applied, will make the Production Engineer's job much easier.

The next section is concerned with the production of iron and steel. It starts with mining and concludes with heat-treatment of steel and deals with most ferrous alloys—methods of forming, protective treatment, etc.

Following this, the next few chapters deal with non-ferrous metals and alloys. In this case, there are described processes which, being used more with non-ferrous materials are dealt with in greater detail, such as pressure die-casting, wire drawing, extruding, drawing, rubber press work, etc.

An unusual feature of this book is the glossary with which it concludes. This consists of nearly 500 terms, the meanings of which, are given in a clear and concise manner.

This book appears to be intended for students because of the questions at the end of the chapters. Do not let this deter other people, such as designers, planners, etc.

Most materials books date easily, but by keeping to the more established processes, this book can easily be kept up to date by further editions when they become necessary.

In all, this is a high-class textbook and comparatively rare by the comprehensive manner in which it deals with its subject.

R.E.M.

331.2 WAGES : PAY

"Wage Incentives in Printing—Incentives Committee of the British Federation of Master Printers" A Report by the Incentives Committee. *London, the Federation,* 1952. 40 *pages.*

This is a Report of the Incentives Committee, set up by the British Federation of Master Printers in 1951, to investigate methods of increasing production and introducing incentive schemes in the printing industry. The Report is fundamentally a critical analysis of the various forms of Incentive Scheme operating in the printing industry, giving a brief description of each, the arguments for and against, and its suitability for firms of various sizes.

The authors of the Report point out that the more simple forms of incentive scheme based on Merit Assessment, Comparison with Past Output Records (expressed in quantity or value), or combinations of these factors have the advantage of low installation and running costs and are easily understood by the operatives. On the other hand, they consider that these schemes may result in standards which are not fair or equitable between different firms and are unlikely to yield large increases in productivity.

Work Measurement schemes are described in some detail, the particular merits of such schemes and the considerable cost of installation and maintenance both being adequately stressed. The Report recognises that a sound Work Measurement scheme can only be installed with the assistance of a trained industrial consultant, and demands a high standard of managerial skill to obtain full advantage of its benefits.

The Report does not recommend any one type of scheme in preference to another, but concludes that no one type is universally applicable to all printing firms. It stresses that financial incentives are only one means of increasing productivity and are no substitute for good management; also that the successful application of any incentive scheme should be a central part of a general overhaul and calls for considerable skill and effort on the part of management. The need for co-ordinating the general principles of incentive schemes in such an integrated industry is stressed, as is the difficulty of co-ordinating detailed Work Values set for widely verying methods and conditions of working.

Throughout the Report, attention is drawn to the suitability of incentive schemes for small firms. The reason for this is apparent from the analysis of firms by size which is given in an appendix. This shows that over 60% of the firms engaged in general printing employ fewer than 25 persons while only 9% employ over 100. It is interesting to note in another appendix that only 2% of the firms operate incentive schemes and that with the exception of Piecework and Profit Sharing schemes the average number of employees in these firms is between 150 and 200. The particular problems involved in applying Work Measurement schemes in small firms are covered in a separate appendix based on the recommendations of three firms of Industrial Consultants.

The general presentation of the Report, its clarity and conciseness, are of an unusually high standard, as are the supporting Appendices.

G.A.H.

OTHER ADDITIONS

159.9 PSYCHOLOGY

Smith, May **"Introduction to Industrial Psychology."** (5th ed.). *London, Cassell,* 1952. 295 *pages.* 12/6d.

Tiffin, Joseph. **"Industrial Psychology."** *London, Allen & Unwin,* 1951. 553 *pages. Illustrated. Charts.* £1. 15. 0.

331.12 ORGANIZATION OF DEPARTMENTS

National Society of Professional Engineers, Washington. **"How to Improve the Utilization of Engineering Manpower: Executive Research Survey Number 2."** *Washington, The Society,* 1952. 55 *pages. Illustrated.* $2.00.

331.124 FOREMANSHIP; SUPERVISION

Conference for Supervisors, Roffey Park, Horsham, 1951. **"Report."** *Belfast, Short Bros. & Harland Ltd.,* 1951. 74 *pages typescript.*

Morton, F. J. Burns. **"Information for Foremen."** *Birmingham, Institute of Industrial Supervisors* [1953] 24 *pages.* 2/6d.

331.152 CO-OPERATIVE ADMINISTRATION; JOINT CONSULTATION

Renold, Sir Charles, *and others.* **"Working of Joint Consultation."** *Birmingham, Industrial Administration Group of the College of Technology,* 1953. 40 *pages.* 3/6d.

338.9 PRODUCTIVITY

Cook, P. H. **"Productivity Team Technique."** *London, Tavistock Institute of Human Relations,* 1951. 84 *pages.* 5/-.

370 EDUCATION

Great Britain—Ministry of Education. **"Education in 1952, being the Report of the Ministry of Education and the Statistics of Public Education for England and Wales.** *London, H.M.S.O.,* 1953. 180 *pages.* 5/-. (Cmd. 8835.)

"Careers Encyclopaedia." Edited by G. H. Chaffe. *London, Avon Press Ltd.,* 1952. 737 *pages.* £1. 5. 0.

Universities and Industry Conference, Leamington Spa, 1952. **Report of the . . . Conference;** organised

by the Federation of British Industries and the Committee of Vice-Chancellors and Principals of the Universities of the U.K. *London, Federation of British Industries,* 1952. 87 *pages.* 5/-.

Great Britain—University Grants Committee. **"University Development: Report on the years 1947-1952."** *London, H.M.S.O.,* 1953. 93 *pages. Illustrated. Diagrams.* 3/6d.

607 RESEARCH

National Physical Laboratory, Teddington, Middx. **"Report for the Year 1952."** *London, H.M.S.O.,* 1953. 72 *pages.* 2/6d.

614.8 PREVENTION OF ACCIDENTS; SAFETY MEASURES

Great Britain—Chief Inspector of Factories. **"Annual Report . . . for . . . 1951."** *London, H.M.S.O.,* 1953. 231 *pages.* 6/6d. (Cmd. 8772.)

Great Britain—Joint Standing Committee on Safety in the Use of Power Presses. **"Second Report of Proceedings."** *London, H.M.S.O.,* 1953. 12 *pages. Illustrated.* 1/-.

621.3 ELECTRICAL ENGINEERING

British Electrical and Allied Industries Research Association, Leatherhead. **"Thirty-second Annual Report . . . for the period ended 31st December, 1952."** *Leatherhead, The Association,* 1953. 162 *pages.*

British Electrical and Allied Manufacturers' Association (Inc.), London. **"Annual Report No. 42, 1952-53."** *London, The Association,* 1953. 50 *pages.*

United States Electric Utilities Team. **"The British Electricity System."** Report of a . . . Team from the U.S.A. which visited the U.K. in 1952. *London, British Productivity Council,* 1953. 58 *pages. Maps. Diagrams.* 3/-. (U.S. Productivity Team Report.)

621.36 INDUCTION HEATING

Philips Electrical Ltd., London. **"The ABC of High Frequency Induction Heating of Metals."** *London, The Firm* [n.d.] 19 *pages. Diagrams.*

Zandstra, K. A. **"High Frequency Heating in Industry."** *London, Society of Engineers (Inc.),* 1950. *Pages* 149-172. *Illustrated. Diagrams.*

919.4 AUSTRALIA

"Australasian Manufacturer: Industrial Annual 1952." *Sydney, Manufacturer Pub. Co.* 328 *pages. Illustrated.* (*Australian Manufacturer,* June 2, 1952.)

660 INDUSTRIAL CHEMISTRY

British Chemical Plant Manufacturers Association, London. **"British Chemical Plant."** *London, the Association,* 1951. 299 *pages. Illustrated. Diagrams.*

British Heavy Chemical Productivity Team. **"Heavy Chemicals."** *London, British Productivity Council,* 1953. 78 *pages. Map. Diagrams.* 3/-. (Productivity Team Report.)

664.86 VEGETABLE PRESERVATION

British Team on Fruit and Vegetable Storage and Pre-packing. **"Fruit and Vegetable Storage and Pre-packing: Report of a Visit to the U.S.A. in 1951."** *London, British Productivity Council,* 1953. 64 *pages. Illustrated.* 3/-. (Productivity Report.)

666 GLASS; CERAMICS

Irwin, J. **"Automatic Production of Pressed Glassware."** 1952. 19 *pages typescript. Photographs. Charts.* (Lord Austin Prize Essay 1952.)

667.6 PAINTS; COLOURS

Imperial Chemical Industries Ltd., Paints Division. **"Improving Paintshop Productivity: Report of a Conference . . . London, 1952."** *London, the Firm,* 1952. 102 *pages. Illustrated. Diagrams.*

Northern Aluminium Company Ltd., London. **"Alpaste: The Aluminium Paste Pigment for Paint and Printing Ink."** *London, the Company,* 1952. 78 *pages. Illustrated.*

669.3 COPPER

Copper & Brass Research Association, New York. **"Copper-base Alloy Rod Handbook."** *New York, the Association,* 1952. 30 *pages. Illustrated. Diagrams.*

669.71 ALUMINIUM

Aluminium Development Association, London. **"Painting Practice for Aluminium."** *London, the Association,* 1952. 19 *pages.* 2/-. (Information Bulletin No. 20.)

T. I. Aluminium Ltd., Birmingham. **"Materials and Fabrication in Aluminium and Aluminium Alloys."** *Birmingham, the Firm,* [1953]. 32 *pages. Illustrated.*

621.51 PNEUMATIC MACHINES AND APPARATUS

Lang Pneumatic Ltd., Wolverhampton. **"Pneumatic Control Equipment."** *Wolverhampton, the Firm,* 1953. *Pages* 40 *plus* xviii. *Illustrated. Diagrams.*

621.771 ROLLING AND WIRE DRAWING MILLS

Franklin, W. W., *and* Bailey, W. **"Hot Rolling Mills: Layout and Design."** *Sheffield, Davy and United Engineering Co. Ltd.,* 1950. 28 *pages. Illustrated. Diagrams.* (*Iron and Coal Trades Review, May* 19 *and July* 21, 1950.)

Goodlad, W. H. **"Features in Rolling Mill Layout and Design Applicable to the Re-rolling Trades."** *Sheffield, Davy and United Engineering Co. Ltd.,* [n.d.] 15 *pages. Illustrated. Diagrams.*

621.78 HEAT TREATMENT

Bullens, D. K. **"Steel and its Heat Treatment."** *5th ed. New York, Wiley; London, Chapman & Hall,* 1948-9. 3 *volumes. Illustrated. Diagrams.* £7. 16. 0.

621.822 BEARINGS

Vacuum Oil Co. Ltd., London. **"Bearing Lubrication."** *London, the Co.,* 1953. 52 *pages. Illustrated.* (*Vacuum Technical Series No.* 7.)

621.86 MATERIALS HANDLING

Caster and Floor Truck Manufacturers' Association, Chicago. **"Handbook of Manual Materials Handling Equipment."** *Chicago, the Association,* 1953. 48 *pages. Illustrated.* $1.00.

621.9 MACHINE TOOLS; MACHINING

Machine Tool Trades Association, London. **"Annual Report 1952 . . . including List of Members."** *London, the Association,* 1953. 27 *pages.*

621.92 GRINDING; POLISHING

American Standards Association, New York. **"Safety Code for the Use, Care and Protection of Abrasive Wheels."** *New York, the Association,* 1947. 66 *pages. Diagrams.* (*ASA B*7.1—1947.)

Grinding Wheel Institute, Cleveland, Ohio. **"Disc Grinding"** *Greendale, Mass., the Institute,* 1950. 18 *pages. Diagrams.*

"Grinding Wheels: (standard shapes and sizes.)" 1951. 83 *pages. Diagrams.* (*Simplified Practice Recommendation R*45-47.)

"Handling, Storage and Inspection of Grinding Wheels." 1952. 14 *pages. Illustrated. Diagrams.*

"Mounted Wheels & Points: Principles of Safe and Efficient Operation with Tables of Critical Speeds." *Rev.* 1946. 26 *pages. Illustrated.*

"Mounting Technique for Wheel Sleeves on Cylindrical Grinding Machines." 1951. 11 *pages. Illustrated. Diagrams.*

"Portable Grinding Machines: Safe and Efficient Operation." 1947. 20 *pages. Illustrated. Diagrams.*

"Recommendations for Maintenance of High Speed Heavy Duty Swing Frame and Floor Stand Grinding Machines using Large Hole Organic Bonded Wheels." 1945. 12 *pages. Diagrams.*

"Safe Speeds for Grinding Wheels." 1949. 17 *pages. Diagrams.*

Heywood, Johnson. **"Abrasive Grains and their Uses,"** *by J. Heywood, under the auspices of the Abrasive Grain Association. Cleveland, Penton Pub. Co.,* 1943. 72 *pages. Illustrated.* $1.00.

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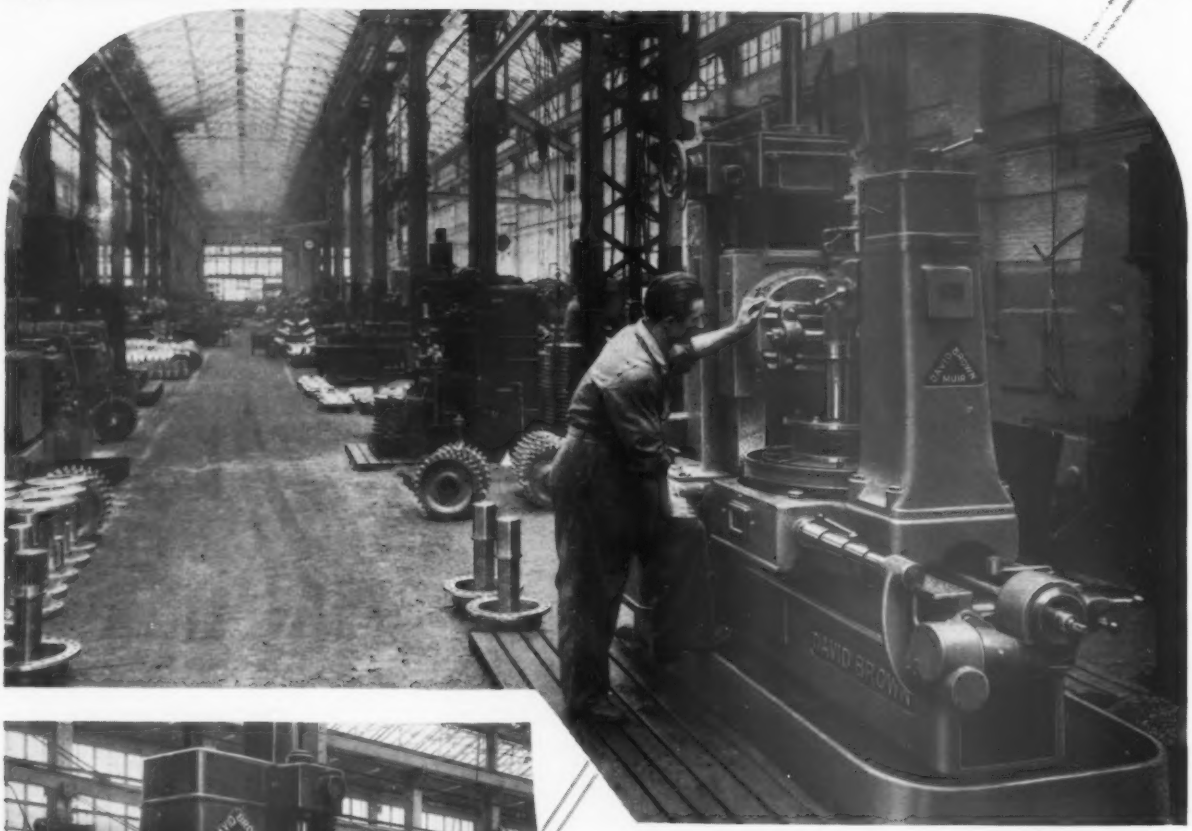

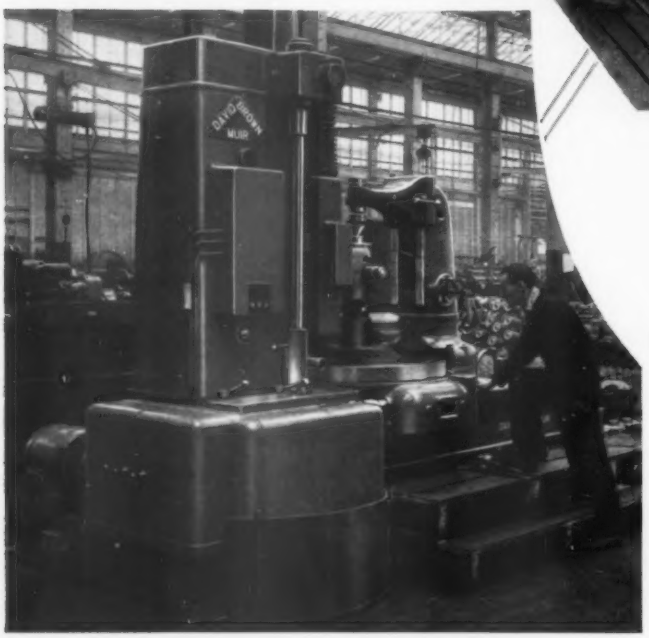

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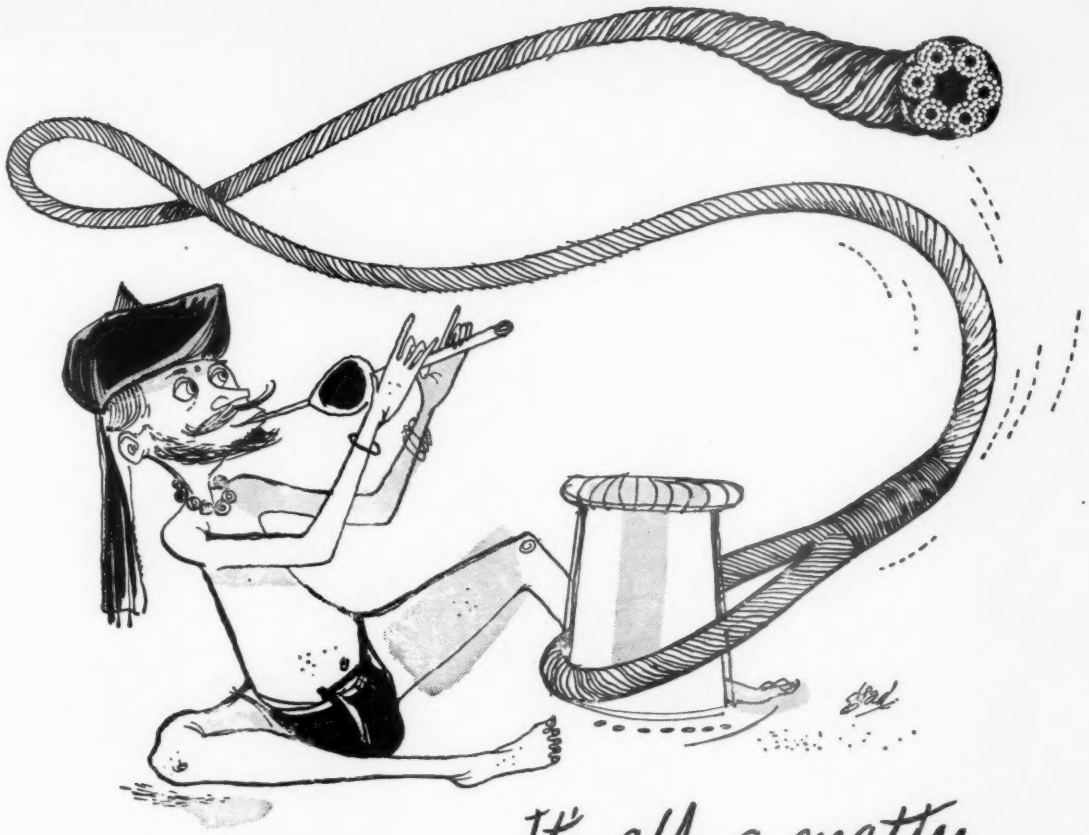

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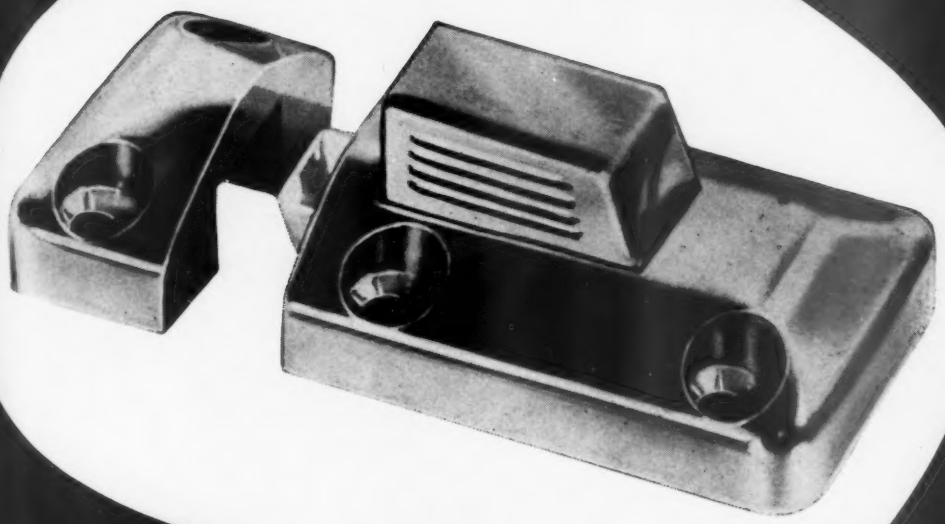

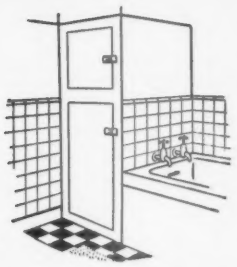

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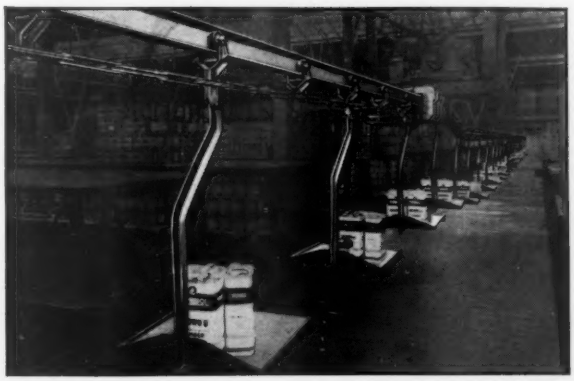

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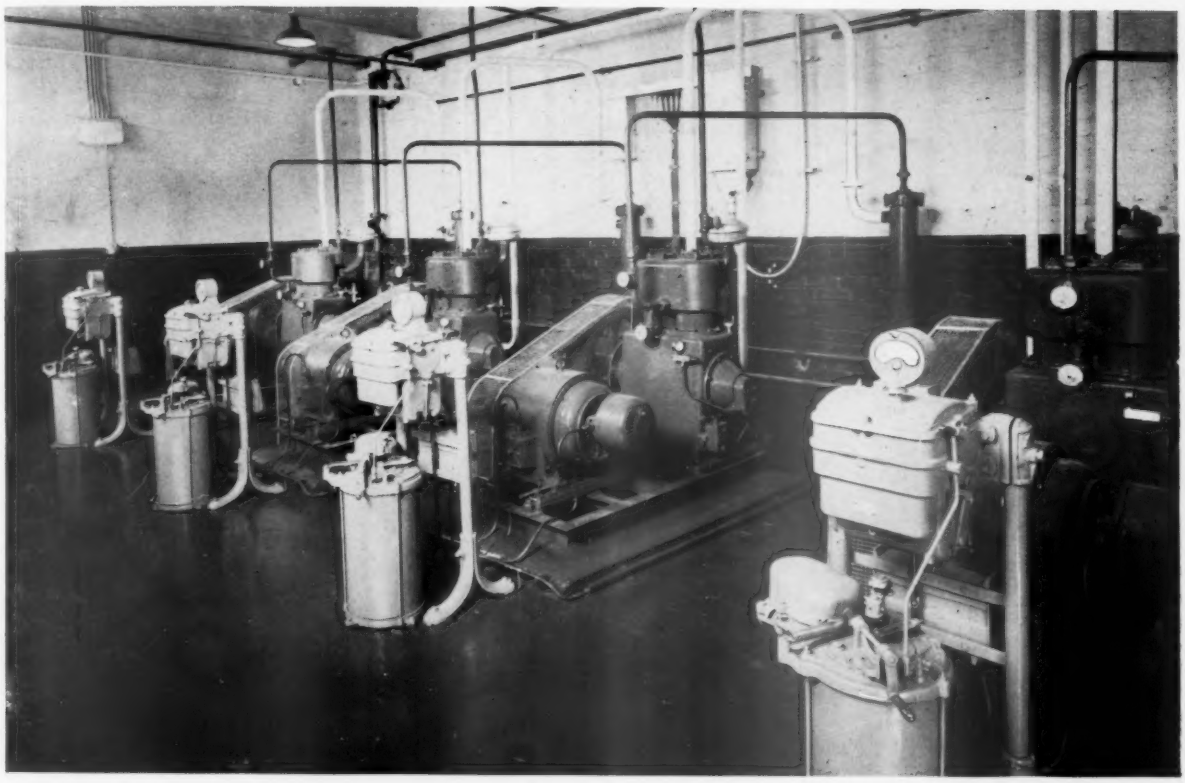

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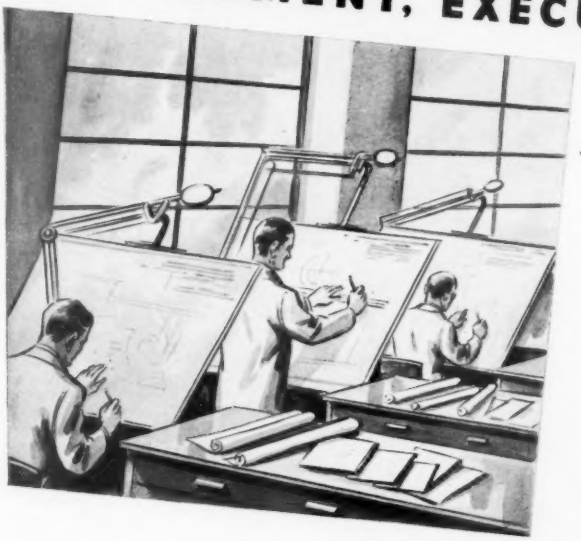

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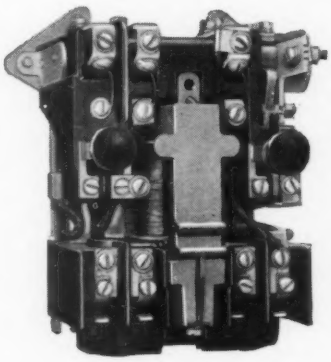

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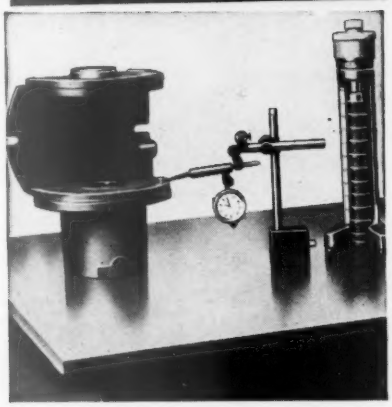

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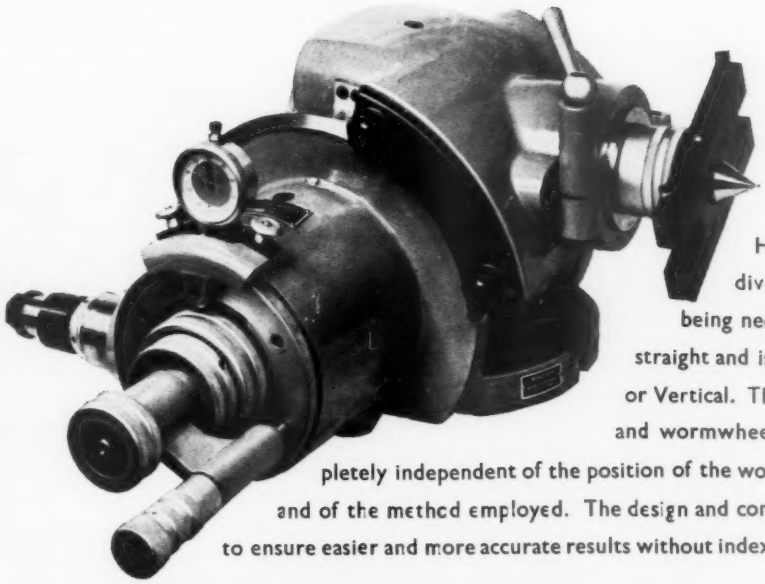

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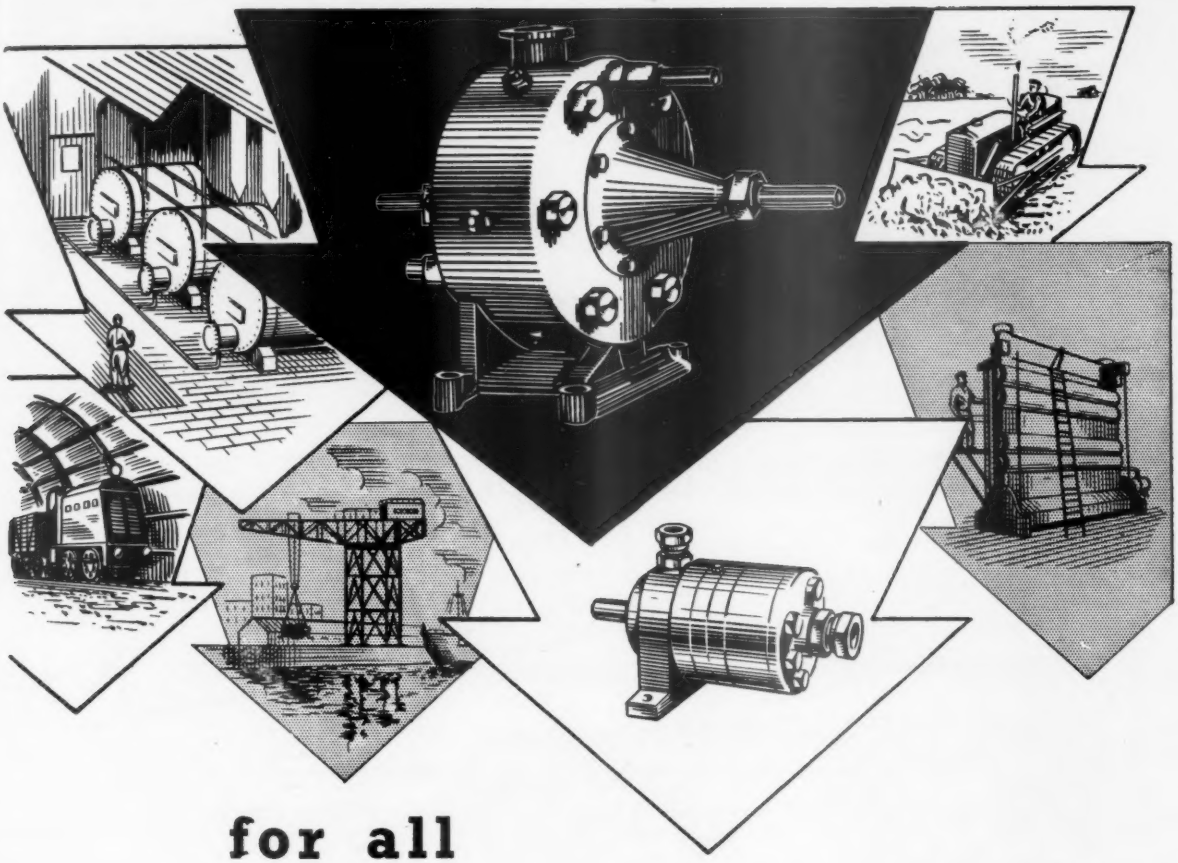

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